MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
NATIONAL AVIATION UNIVERSITY
Faculty of Transport, Management and Logistics
Logistics Department

APPROVED
Acting Head of the Department
Svitlana SMERICHEVSKA
(signature, name and surname)
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QUALIFICATION WORK

(EXPLANATORY NOTES)

OF GRADUATE OF ACADEMIC DEGREE

«BACHELOR»

THEME: **«Supply chain management for self-produced food products»**

Speciality 073 «Management»

Educational and Professional Program « Logistics »

Done by Leiko Kira
(surname and name) (signature, date)

Supervisor Karpun Olga
(surname and name) (signature, date)

Standards Inspector Karpun Olga
(surname and name) (signature, date)

I certify that in this master thesis
there are no borrowings from the works of other authors
without appropriate references *Kira LEIKO*
(signature) (name and surname)

Kyiv 2024

МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
НАЦІОНАЛЬНИЙ АВІАЦІЙНИЙ УНІВЕРСИТЕТ
Факультет транспорту, менеджменту і логістики
Кафедра логістики

ЗАТВЕРДЖУЮ
В.о. завідувача кафедри логістики
Світлана СМЕРІЧЕВСЬКА
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«03» червня 2024 р.

КВАЛІФІКАЦІЙНА РОБОТА

(ПОЯСНЮВАЛЬНА ЗАПИСКА)

ЗДОБУВАЧА ОСВІТНЬОГО СТУПЕНЯ

«БАКАЛАВР»

ТЕМА: **«Управління ланцюгом постачання харчових продуктів власного виробництва»**

зі спеціальності 073 «Менеджмент»
(шифр і назва)

освітньо– професійна програма «Логістика»
(шифр і назва)

Здобувач: Лейко Кіра Кирилівна
(прізвище, ім'я та по батькові) (підпис, дата)

Науковий керівник: Карпунь Ольга Василівна
(прізвище, ім'я та по батькові) (підпис, дата)

Нормоконтролер: Карпунь Ольга Василівна
(прізвище, ім'я та по батькові) (підпис, дата)

Засвідчую, що у цій кваліфікаційній роботі немає запозичень з праць інших авторів без відповідних посилань *Кіра ЛЕЙКО*
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Київ 2024

NATIONAL AVIATION UNIVERSITY
Faculty of Transport, Management and Logistics
Logistics Department

Academic Degree Bachelor

Speciality 073 «Management»

Educational and Professional Program « Logistics »

APPROVED
Acting Head of the Department

Svitlana SMERICHEVSKA
(signature, name and surname)
«13» May 2024

TASK

FOR COMPLETION THE QUALIFICATION WORK OF GRADUATE

Kira Leiko
(name and surname)

1. Theme of the qualification work: «Supply chain management for self-produced food products» was approved by the Rector Directive №624/ст. of April 24, 2024.

2. Term performance of the work: from May 13, 2024 to June 16, 2024.

3. Date of submission work to graduation department: June 03, 2024.

4. Initial data required for writing the work: general information about supply chain and management of supply chain, information of the company VISTA LLC, financial indicators of the company VISTA LLC, articles by specialists in the field of supply chains for food manufacturers, Internet source.

5. Content of the explanatory notes: introduction, the essence of the supply chain and supply chain management; the specifics of food supply chain management; technologies which are used to improve food supply management; analysis the activity of the company VISTA LLC; recommendations for organization of cold supply chain management for «Vista» enterprise; recommendations for improving supply chain management for self-produced food products for «Vista» enterprise; conclusions.

6. List of obligatory graphic matters: tables, charts, graphs, diagrams illustrating the current state of problems and methods of their solution.

7. Calendar schedule:

№	Assignment	Deadline for completion	Mark on completion
1	2	3	4
1.	Study and analysis of scientific articles, literary sources, normative legal documents, preparation of the first version of the introduction and the theoretical chapter	13.05.24-16.05.24	Done
2.	Collection of statistical data, timing, detection of weaknesses, preparation of the first version of the analytical chapter	17.05.24-20.05.24	Done
3.	Development of project proposals and their organizational and economic substantiation, preparation of the first version of the project chapter and conclusions	21.05.24-26.05.24	Done
4.	Editing the first versions and preparing the final version of the qualification work, checking by standards inspector	27.05.24-29.05.24	Done
5.	Approval for a work with supervisor, getting of the report of the supervisor, getting internal and external reviews, transcript of academic record	30.05.24-02.06.24	Done
6.	Submission work to Logistics Department	03.06.24	Done

Graduate_____
(signature)

Supervisor of the qualification work _____
(signature)

8. Consultants of difference chapters of work:

Chapter	Consultant (position, surname and name)	Date, signature	
		The task was given	The task was accepted
Chapter 1	Associate Professor, Karpun O.V.	13.05.24	13.05.24
Chapter 2	Associate Professor, Karpun O.V.	17.05.24	17.05.24
Chapter 3	Associate Professor, Karpun O.V.	21.05.24	21.05.24

9. Given date of the task May 13, 2024.

Supervisor of the qualification work: _____ Olga KARPUN
(signature of supervisor) (surname and name)

Task accepted for completion: _____ Kira LEIKO
(signature of graduate) (surname and name)

ABSTRACT

The explanatory notes to the qualification paper «Supply chain management for self-produced food products» comprises of 94 pages, 20 figures, 27 tables and 60 references.

KEY WORDS: SUPPLY CHAIN, SUPPLY CHAIN MANAGEMENT, SELF-PRODUCED FOOD PRODUCTS, COLD CHAIN, BLOCKCHAIN.

Supply chain management for self-produced food products at the enterprise is considered in the qualification paper.

The theoretical part covers the essence of the concepts "supply chain" and "chain management supply and specifics of food supply chain management. The analytical part is devoted to the analysis of financial and economic activity of "Vista" LLC and find ways of supply chain optimizing and modernization.

The purpose of the qualification work is to study and generalize theoretical approaches, as well as to develop practical recommendations for improving supply chain management for self-produced food products.

The object of the research is processes in supply chains of the enterprise "Vista" LLC. The subject of the research is modern technologies for improving supply chain management.

Methods of research are analysis, synthesis, induction, deduction, modeling, generalization.

Materials of qualification paper are recommended to be used during scientific research, in the educational process and in the practice of specialists of logistics departments.

CONTENTS

NOTATION

CPFR – Collaborative Planning, Forecasting and Replenishment;

LLC – Limited liability company;

SC – Supply Chain;

SCM – Supply Chain Management;

SIM – Supplier Inventory Management;

SKU – Stock Keeping Unit;

WMS – Warehouse Management System.

INTRODUCTION

The global integration of the world economy, marked by intense competition and the rapid obsolescence of unique products and technologies, is increasingly influencing the operations of contemporary businesses in Ukraine. These developments compel organizations to reorganize their operations, broaden their scope, and implement new information technologies. Increasing of demands on products are promoting the rise of a novel economy where accumulated knowledge and its exchange will take precedence.

The company's competitiveness and sustainability will be contingent not only on access to resources but also on the efficacy of organizational structure and management practices, the utilization of advanced communication tools, collaborative partnerships with clients and associates, and the dissemination of knowledge-sharing technologies.

In the current conditions of the modern economy, the strategy of a company engaged in production activities should be aimed at improving the quality of customer service and competitiveness. To do this, it is necessary to consolidate all value-added processes and make them optimal at each stage. Such problems can be solved by applying the concept of supply chain management, which helps to coordinate all stages of activity from the purchase of raw materials to the transfer of finished products to the client, and to reduce the overall costs of the entire chain.

The characteristics of the food industry mean that the flow of goods, information services is very complex and diverse. For example, various types of raw materials received from suppliers must be placed in warehouses and appropriate storage conditions must be provided for each type. It is necessary to plan the production of each type of product using different production facilities, taking into account customer demand, available capacity and resources, and production costs. Then, taking into account the relevant shelf life characteristics, it is necessary to

ensure the management of raw materials and inventories in 3 levels: storage of raw materials, semi-finished products and finished products.

It is necessary to organize the transportation of raw materials and finished products between these 3 levels, as well as timely delivery of finished products to customers and distributors. Customers are concerned about minimizing costs while maximizing quality service.

Finally, it is necessary to create efficient pricing mechanisms that will minimize costs, achieve profitability standards and ensure product competitiveness in the market. Coordinating the flow of goods, information and finance and optimizing business processes requires effective supply chain management.

A pressing issue within contemporary supply chains is the efficient handling of end-to-end management of the supply chain and coordination among its constituent systems. This issue often leads to numerous errors and discrepancies in the supply chain, negatively impacting not just the chain's stakeholders but, most importantly, the customers. Material flows may be misdirected, delayed, or advanced to inappropriate destinations, significantly deviating from established logistics and supply chain principles.

Addressing this challenge involves streamlining end-to-end management and implementing real-time monitoring of information and cargo.

The purpose of the qualification work is to study and generalize theoretical approaches, as well as to develop practical recommendations for improving supply chain management for self-produced food products.

The object of the research is processes in supply chains of the enterprise «Vista» LLC.

The subject of the research is modern technologies for improving supply chain management.

The research process involved the following tasks:

– review of theoretical literature;

– analysis of financial metrics and production/delivery processes of a Ukrainian company to assess the current situation;

– development of practical recommendations based on a comprehensive examination of potential solutions for enhancing supply chain efficiency and optimizing interaction among warehouse systems.

The research focuses on end-to-end management of business operations within enterprise supply chains, with a specific emphasis on managing interactions between entities on each stage of chain and controlling material and information flows in this chain.

CHAPTER 1
THEORETICAL ASPECTS OF FOOD SUPPLY CHAIN MANAGEMENT

1.1 The essence of the concepts "supply chain" and "chain management supply"

The term "supply chain management" is a recently new term used in the public domain, the history of supply chain management goes back more than 100 years to Fredrick Taylor in 1911. This way of operations researches and analytic value became the method of logistics during World War II military operations in the 1940's. Thus, the concepts of industrial engineering and operations research merged to become supply chain engineering. These concepts have seen many progressions in the last six decades [36].

The analysis of the main definitions of the term "Supply Chain" is given in the Table 1.1.

A flexible and efficient supply chain is one of the most fundamental competitive advantages of a company in any industry and in any market today. The supply chain is closely linked to production, marketing, sales, finance and other departments of the company.

Nowadays, activities aimed at managing the supply chain have become equally important in product promotion than marketing. By attracting buyers through a well-structured marketing campaign, it is impossible to increase a product's market share without an effective supply chain process.

The supply chain includes many business processes such as manufacturing, material supply, purchasing, inventory management, distribution, sales forecasting, sales and customer service. In addition to these processes, it may include processes of

distribution, retail and logistics companies, as well as processes for delivering and processing products to consumers.

Table 1.1 – Definition of the term "Supply Chain"

Author	Definitions of Supply Chain
1	2
Lambert, Stock and Ellram, 1998) [6]	The concept of “supply chain” is generally referred to as the alignment of firms that bring products or services to market. The supply chain includes manufacturer, suppliers, transporters, warehouses, wholesalers, retailers, other intermediaries and even customers themselves.
Mark Johnson, Carlos Mena [34]	The supply chain as a process is a set of flows and their corresponding cooperation and coordination processes between various participants in the value chain to meet consumer requirements for goods and services.
Adam Hayes [1]	The term “supply chain” refers to a whole system of processes that determine the flow of information, material assets and finance from suppliers to end consumers. It consists of a large number of links, which represent chain objects.
Edouard Thieuleux [38]	A supply chain is 3 or more economic units (legal entities or individuals) that are directly involved in the external and internal flow of goods, services, finance and/or information from source to consumer
Robert H. Smith [45]	A supply chain – is a global network that transforms raw materials into products and services needed by end users and manages information, inventories, and cash flows. That system includes activities, information flows, storage and distribution operations, and product life cycle processes, from raw materials to customers, is called a supply chain.
Ben Lutkevich [42]	A supply chain is a system of processes that determine the formation of information, physical and financial flows from suppliers to final consumers. It consists of many links – chains of objects.

Researchers have identified some key areas that primarily focus on supply chain management (Fig. 1.1).

The success and profit of a company depend on effective supply chain management. The enterprise cannot independently control the production and distribution of products. The responsibility and competitiveness of a product or

service in the supply chain depends not only on the company, but also on the entire supply chain. These companies are legally independent of each other, but economically they are very interdependent. Thus, the supply chain is a production system that includes all parties involved along the path from the raw material stage to the consumer stage.

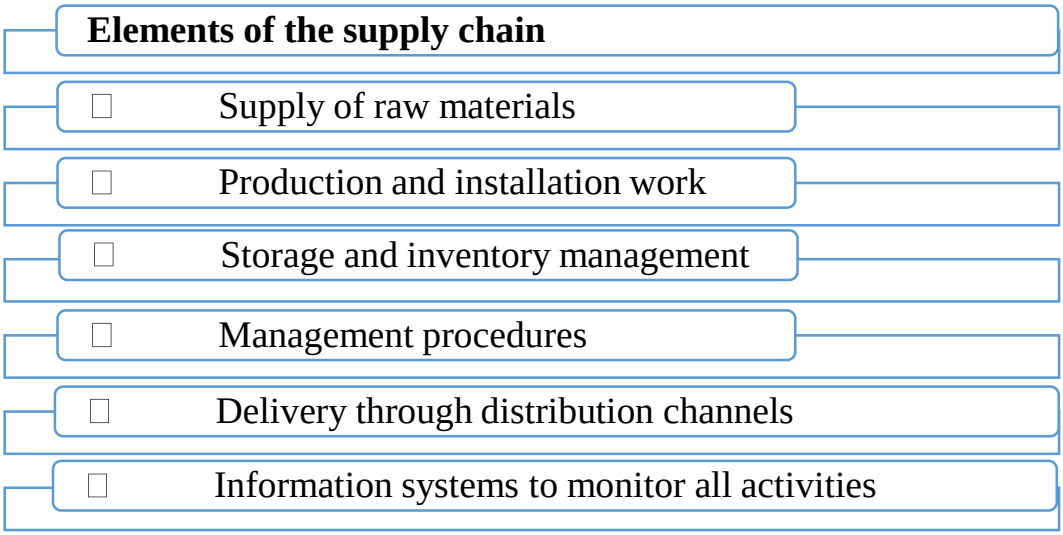

Figure 1.1 – Elements of the supply chain [46]

Therefore, supply chain performance should always be measured and ultimately determined. For this purpose, it is very important to develop and apply a unified evaluation system in this area.

Main tasks of supply chain are presented in Fig. 1.2.

Thus, these three drivers of the supply chain determine the three main areas of evaluation of the company's performance, namely:

– maintainability (how well customer needs are being met);

– efficiency (usage the company's resources rationally);

– flexibility (how does the company prepared for the next changes).

In addition to other objectives arising from the company's target structure, it is recommended that these interrelate with other definitions that need to be mentioned in the context of supply chain management, and the fundamentals of the indicator model are used to evaluate the company's supply chain performance.

Figure 1.2 – Main tasks of supply chain

The analysis of the main definitions of the term "Supply Chain Management" is given in the Table 1.2.

Table 1.2 – Definition of the term "Supply Chain Management"

Author or source	Definitions of Supply Chain Management
1	2
Martin Christopher [17]	Supply Chain Management means a systematic approach to building the work of each facility to minimize risks, increase economic performance, reduce operating costs and increase the level of service.
Muhammad Farooque, Matthias Thurer [3]	Supply chain management – is a management concept and organizational strategy consisting of an integrated approach to planning and managing the entire flow of information about raw materials, materials, products, services emerging and transforming in the logistics and production processes of an enterprise, aimed at a measurable total economic effect (cost reduction, meeting demand for final products).
Wikipedia [49]	Supply chain management is the management of the flow of goods, data and finance associated with a product or service, from the procurement of raw materials to the delivery of the product to its final destination.
Internet resource [47]	Supply Chain Management is the integration of suppliers, manufacturers, warehouses and distributors to produce goods and services in the right quantities and deliver them to the right place at the right time with minimal cost. Thus, the concept of supply chain management includes production planning, resource allocation, transportation of raw materials and finished products, management of product flows, inventory, warehouse resources, order delivery, after-sales support and other related processes.

SCM covers the most important aspects of business: purchasing management, order management, product life cycle management, production and inventory planning, logistics operations. This creates a complex and complex mechanism in which each link in the chain is built into a single flexible system.

The concept was proposed in 1982 by Keith Oliver, subsequently developed and received practical implementation using application software – supply chain management systems.

Although many people equate supply chain with logistics, logistics is actually only one component of a supply chain. Modern digitally managed SCM systems include material processing and software for all parties involved in creating products or services, fulfilling orders, and tracking information, such as suppliers, manufacturers, wholesalers, transportation and logistics providers, and retailers. [44]

Supply chain operations cover aspects such as purchasing, product life cycle management, supply chain planning (including inventory planning and maintenance of enterprise assets and production lines), logistics (including transportation and fleet management), and order management. SCM can also extend to activities related to global trade, such as global supplier management and multinational manufacturing processes.

Supply chain management is the integration of seven key business processes, namely (Fig. 1.3).

The main goal of implementing a supply chain management system is to maximize the final value that is created with the participation of all the links that make up it. At the same time, two main tasks that face every enterprise are solved:

– increasing profits from the sale of manufactured products by improving service and increasing the accuracy of consumer demand forecasts;

– cost reduction by minimizing inventories, reducing warehouse and transportation costs for purchasing and warehousing, rationalizing the use of production capacity and material resources.

From a theoretical point of view, the functionality of SCM can be divided into two main areas. The physical function covers all processes of converting raw

materials and materials into finished products. The intermediary function is aimed at satisfying the demand that arises from consumers.

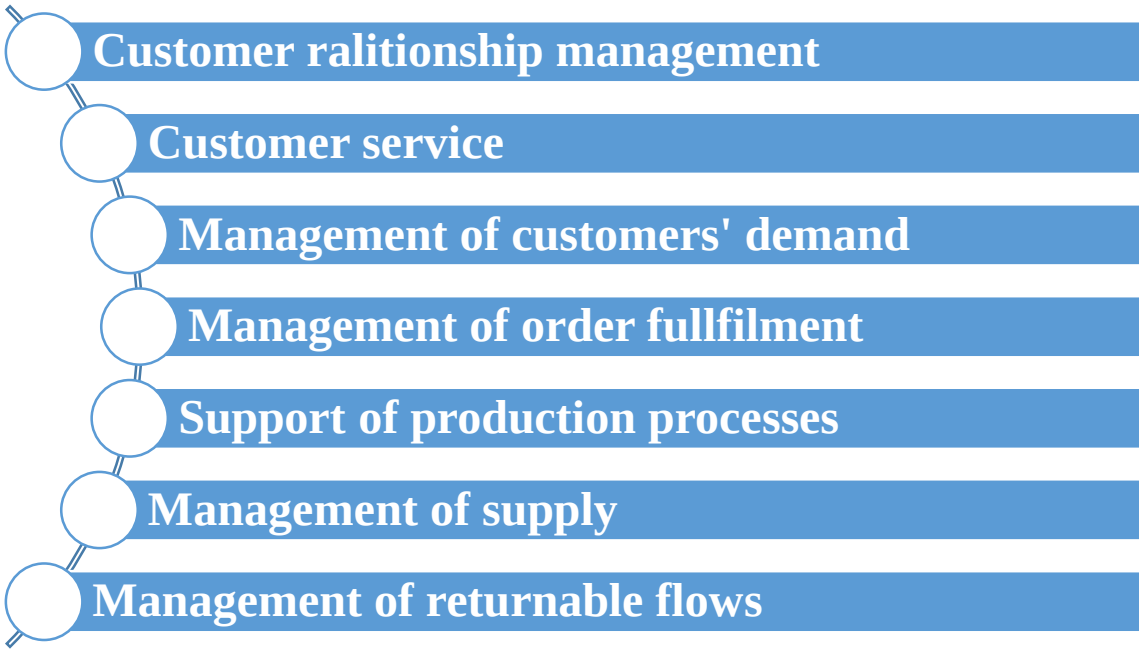

Figure 1.3 – Key business processes of supply chain management

Functions of supply chain management presented in Fig. 1.4.

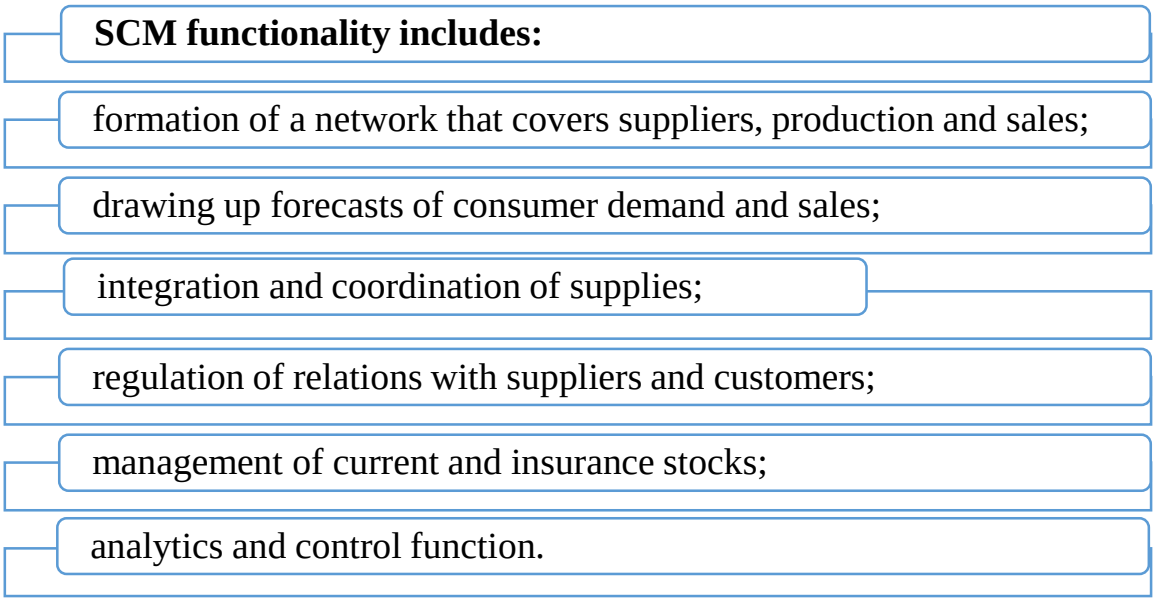

Figure 1.4 – Functions of supply chain management

The SCM concept considers the following as sources of efficiency improvement:

– improving the quality of planning through the use of the latest information systems and integration of information flows;

– synchronization of business processes, which allows you to reduce the period of bringing a manufactured product to market;

– improving the quality of management activities through constant monitoring of the entire chain and identifying deviations;

– cost reduction by increasing system flexibility and reducing uncertainty

1.2 Specifics of food supply chain management

The specifics of the food industry present great complexity and diversity in the flow of goods, services and information. For example, different types of raw materials received from suppliers must be stored in a warehouse to ensure proper storage conditions for each type of raw material. Production must be planned, different production facilities are used for each type of product, taking into account the needs of the consumer, demand, spare capacity and resources, and production costs and relevant characteristics and shelf life. It is necessary to organize, among them, the transportation of raw materials and finished products, timely delivery of finished products to customers and distributors, as well as taking into account the level of minimization of costs and the highest quality of customer service.

It is also necessary to create effective pricing mechanisms that minimize costs, achieve profitability standards and ensure the competitiveness of products.

The supply chain consists of several heterogeneous components interconnected by information, money and flow of goods, starting with the acquisition of raw materials from suppliers and ending with the sale of finished goods and services to the client through retail chains. These components include both the constituents of one organization and its suppliers, distributors and customers.

The food supply chain includes a number of stages, from production to delivery of products to consumers. The main stages of the supply chain include (Table 1.3).

Table 1.3 – The main stages of the supply chain

Name of the stage	Stage operations description
1	2
Manufacturing	This stage includes the production of agricultural products, food products and beverages. This can be either agriculture or production in factories.
Processing and packaging	Food is processed, packaged, and prepared for shipment to warehouses or stores.
Warehousing	Products are stored in warehouses until dispatch. Warehouses must be equipped in such a way as to ensure proper storage of products in compliance with all safety and quality standards.
Transportation	Products are transported to their destination using various modes of transportation such as trucks, trains, ships and airplanes.
Distribution	Products are distributed to various points of sale, including supermarkets, restaurants, cafes and other food service establishments.

The benefits of effective supply chain management are better customer service, cost reduction, lower product prices, optimal distribution of inventories along the supply chain, effective management of production processes, commodity and raw material inventories. This is achieved by solving the following problems:

Demand management using a variety of statistical forecasting algorithms, seasonal factors and selecting the optimal algorithm from several possible ones. Forecasting can be extended to all parts of the supply chain, including distributors and customers. Collaborative Planning, Forecasting and Replenishment (CPFR) and Supplier Inventory Management (SIM) applications provide this capability. The result is a demand distribution plan agreed upon by all departments, which determines where exactly a given product should be produced, when it should be shipped, where and in what quantity it should be stored for the most optimal implementation of the sales plan [43].

Production planning – planning the use of existing production facilities, taking into account maximizing production load and minimizing production costs, as well as work related to equipment changeover. Thus, it is detailed what, when and how to produce, taking into account the limitations of production lines, raw materials and materials, batch sizes, large and small scale adjustments depending on the product.

Managing relationships with suppliers and customers – establishing a joint planning process with suppliers of raw materials, buyers of finished products and logistics operators.

This makes it possible to optimize the purchasing and sales process by sharing useful information with suppliers, manufacturers and distribution networks.

Supply and transport planning – modelling multi-level supply chain networks while simultaneously managing restrictions on inventories and other resources. It is also possible to transfer inventory in the event of a shortage. Transportation routes are selected taking into account cost minimization, timely delivery and other parameters.

Warehouse management – inventory planning and management of warehouses and distribution centres.

The system fully automates work with the warehouse, optimizes the operation of warehouse premises and provides monitoring, control and distribution of tasks. The solution also allows you to calculate a safe level of inventory using statistical and heuristic methods, and prevents a decrease (increase) in inventories below (above) critical values.

In the manufacturing sector in general and at food industry enterprises in particular, with the help of SCM solutions it is possible to create consolidated plans for sales, production, purchases of raw materials and materials and movements of raw materials and finished products, detailed down to the SKU (Stock Keeping Unit) and distribution channel level.

Sales plans are necessarily consistent with existing production capacities. Planning is possible on various horizons – rolling annual planning, tactical monthly planning broken down by weeks and days, and operational daily planning.

Annual planning involves the creation of consolidated sales plans, a master production plan and a plan for the required materials. Tactical planning is based on annual plans and means creating monthly sales, purchasing and movement plans.

Operational daily planning involves the creation of production tasks and plans for loading production lines. SCM solutions have the capabilities of scenario modelling, creating several variants of plans for different scenarios. Such solutions also support optimization planning, i.e. the creation of plans optimized according with agreed upon criteria.

The capabilities of SCM solutions described above allow company to optimize the activities of an enterprise in five main areas: production, costs, revenues and profits, order fulfilment and logistics. By optimizing the movement of goods throughout the value chain, company profitability increases. In addition to clearly measurable indicators, the implementation of SCM solutions additionally gives companies a number of competitive advantages, such as more effective and coordinated control over the activities of various functional departments, transparency, accuracy and timely availability of business information along the entire length of the supply chain for clear management decisions. This allows companies to respond more quickly to the slightest changes in market conditions, including technological changes and fluctuations in demand and prices. The effectiveness of implementing SCM solutions is confirmed by the positive experience of their implementation in leading companies in the food industry.

1.3 Technologies which are used to improve food supply management

The supply chain management process has been around for centuries, but only in recent years has it become a vital part of business operations. With the rise of e-commerce, globalization and a more competitive market, companies must be more efficient than ever before. That's where supply chain management optimization

comes in supply chain comes into play. By optimizing the process, businesses can reduce costs, increase productivity and increase customer satisfaction.

The best practices in optimizing supply chain are presented in Table 1.4.

Table 1.4 – The best practices in optimizing supply chain [35]

Name of practice	Operations description
1	2
Collaboration and communication	Collaboration and communication are key to identifying bottlenecks, reducing order lead times and improving overall efficiency. This means working closely with suppliers, manufacturers, distributors and customers to develop a seamless process that benefits everyone.
Inventory Management	By tracking inventory levels and demand, businesses can avoid overstocking, reduce waste, and improve cash flow. This means using software and tools that can help track inventory levels, forecast demand and manage orders.
Transportation Management	By optimizing transportation management, businesses can reduce lead times, improve delivery times, and reduce transportation costs. This means using software and tools that can help manage transport routes, track shipments and optimize delivery schedules.
Data Analytics	By analysing data from various sources, businesses can identify areas for improvement, measure performance and make data-driven decisions. This means using software and tools that can help collect and analyse data such as inventory levels, order history and customer feedback.
Continuous Improvement	By continuously monitoring and improving the process, businesses can stay ahead of the competition and remain flexible in a rapidly changing market. This means regularly reviewing performance indicators, identifying areas for improvement, and implementing changes in the process.

Optimizing supply chain management is critical to the success of any business. By following these best practices, businesses can reduce costs, increase productivity, and increase customer satisfaction.

Cross-docking is a system of organizing warehouse processes, in which the operations of receiving and shipping goods are carried out without placing them in the long-term storage area. In other words, when using cross-docking technology, the cargo passes through the warehouse directly.

In contrast to a traditional warehouse, cross-docking is a set of logistics operations, with the help of which there is an opportunity to eliminate the stage of cargo storage in warehouse areas.

Cross-docking operations are presented in Fig. 1.5.

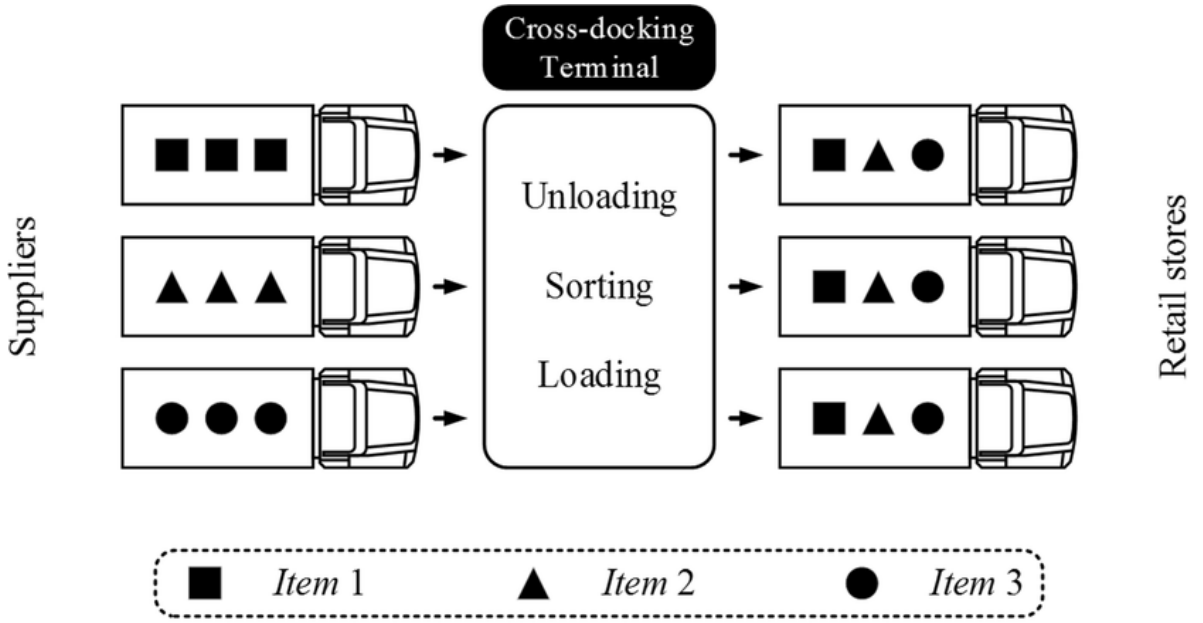

Figure 1.5 – A scheme of a cross-docking system [16]

As a result of such integration of processes in the supply chain, logistics costs are significantly reduced, and delivery time is reduced, and the product is delivered in the shortest possible time.

Other advantages of implementing cross-docking technology:

– the need for warehouse space is reduced and the load on storage areas is reduced;

– there is an opportunity for clear planning of supplies;

– the number of personnel and auxiliary equipment is reduced;

– the time the goods are in the warehouse decreases, thereby increasing the average daily turnover of the warehouse;

– production warehouse stocks are optimized: the insurance stock is reduced and the assortment is expanded.

However, like any other technology, cross-docking has not only advantages, but also disadvantages:

– clear coordination of all participants in the logistics chain is necessary, otherwise non-observance of time limits will lead to loss of time, downtime of vehicles and disruption of delivery deadlines;

– does not provide for internal control of the quantity and quality of the received and shipped goods, both at the level of the warehouse and at the level of the cargo unit, which may subsequently lead to disagreements between the supplier and the consignee;

– a connection between the WMS system of the cross-docking operator and the ERP system of the supplier and consignee is necessary, otherwise problems arise with the design and formation of the shipment.

The listed restrictions create many obstacles for companies to implement cross-docking. The effectiveness of using technology largely depends on compliance with standards and clear organization of business processes. Precisely because of the complexity of implementation, Ukrainian companies use this technology extremely rarely. Many are not ready to take risks and do not go beyond traditional logistics processes.

The effectiveness of cross-docking can be assessed by means of a comparative analysis of the costs of fulfilling orders when using the technology of traditional and end-to-end storage This comparison shows that the introduction of cross-docking technology can reduce costs by approximately 50%.

When deciding to introduce technology, the most appropriate type of cross-docking should be determined. To do this, it is necessary to assess the existing capabilities of the enterprise. The changes required to move to a new technology depend on the volume of supplies, the processing requirements of the selected goods, the type of cargo handling, etc.

Since end-to-end warehousing is faster than traditional warehousing, it is important not only to receive information in real time, but also to use it effectively.

To do this, you need to have both a WMS system and its integration with the ERP systems of suppliers and consignees.

It is very important that any implementation begins with a pilot program so that cover only part of the cargo and suppliers. This will allow you to study how the technology works in a given plant environment on a small scale and correct any shortcomings before it is used for an entire product line or warehouse network.

Speaking about global experience, foreign companies are actively using end-to-end storage technology.

Cross docking is widely used in retail. The experience of leading companies such as Walmart, METRO Cash & Carry, which have successfully implemented cross-docking, confirms the promise of this technology not only in creating competitive advantages in speed and quality of work, but also in reducing costs.

Experts are inclined to argue that in Ukraine there are all the prerequisites for the development of cross-docking. Professional software combining accounting systems and commodity flow management is being intensively developed. Soon there will be a demand for terminals that move goods from one type of transport to another, and instantly send them to the consumer.

These and other factors will allow domestic companies to fully use modern cross-docking technology, which will provide an opportunity to increase competitive advantages not only in the domestic market, but also in the global one.

Another technology which continues gaining impact in supply chains of food products is cold chain.

Recently, the concept of “cold chain” has become increasingly common in the logistics of perishable food products – meat, milk, fruits and vegetables, fish, eggs and other products that require special temperature conditions during storage and transportation.

Because of the development of the market for frozen and refrigerated items, as well as the expansion in the "transport influence" in the worldwide vehicle framework, the interest for transportation and capacity under unique temperature conditions is developing.

The development of customer markets and globalization in planned operations are expanding the prerequisites for the hardware and data advances utilized. The vehicle distance is protracting, the coordinated factors chain is turning out to be more mind boggling, more extra connections show up in it – dissemination focuses, cross-dock locales. During the development of products, there is a need to control the phases of its transportation, where an infringement of temperature conditions might happen, which prompts a deficiency of nature of merchandise that are delicate to temperature changes.

The main components of the cold chain that ensure its operation are, first of all, technologies that are implemented using software and hardware systems and trained qualified personnel. The use of equipment that meets legal requirements for a specific type of temperature cargo, and compliance with rules and restrictions on joint storage and transportation are the basis of the cold chain. Failure to comply with these requirements leads to damage to the cargo: a reduction in its shelf life or loss of quality and properties. The equipment necessary to ensure the cold chain is insulated vans, wagons, refrigerated vehicles, refrigerated wagons, and specialized warehouses.

Chapter 1 summary

The concept of “supply chain” is generally referred to as the alignment of firms that bring products or services to market. The supply chain includes manufacturer, suppliers, transporters, warehouses, wholesalers, retailers, other intermediaries and even customers themselves. A flexible and efficient supply chain is one of the most fundamental competitive advantages of a company in any industry and in any market today. The supply chain is closely linked to production, marketing, sales, finance and other departments of the company.

Supply chain management – is a management concept and organizational strategy consisting of an integrated approach to planning and managing the entire

flow of information about raw materials, materials, products, services emerging and transforming in the logistics and production processes of an enterprise, aimed at a measurable total economic effect (cost reduction, meeting demand for final products).

The specifics of the food industry present great complexity and diversity in the flow of goods, services and information. Production must be planned, different production facilities are used for each type of product, taking into account the needs of the consumer, demand, spare capacity and resources, and production costs and relevant characteristics and shelf life. It is necessary to organize, among them, the transportation of raw materials and finished products, timely delivery of finished products to customers and distributors, as well as taking into account the level of minimization of costs and the highest quality of customer service.

The development of customer markets and globalization in planned operations are expanding the prerequisites for the hardware and data advances utilized. The vehicle distance is protracting, the coordinated factors chain is turning out to be more mind boggling, more extra connections show up in it – dissemination focuses, cross-dock locales. During the development of products, there is a need to control the phases of its transportation, where an infringement of temperature conditions might happen, which prompts a deficiency of nature of merchandise that are delicate to temperature changes.

CHAPTER 2
ANALYSIS OF THE ORGANIZATIONAL AND ECONOMIC CHARACTERISTICS OF THE SUPPLY CHAIN MANAGEMENT FOR SELF-PRODUCED FOOD PRODUCTS OF "VISTA" LLC

2.1 General description of "Vista" LLC activity

The «Vista» company was founded in 1998 by a team of young, energetic and goal-oriented like-minded people to translate food production knowledge into real results. Already in 1999, the production of light oils and margarines was launched at its own production facilities. The excellent quality of the products allowed company to begin rapidly conquering the market.

In 2000, the enterprise, having significantly increased its capacity for the production of margarines and light oils, commissioned a workshop for the production of mayonnaise and sauces. Currently, the plant is able to produce up to 100000 finished products per month. The volume of production increases annually, so the range of my products is constantly expanding. Production volumes are increasing annually, and the range of manufactured products is constantly expanding. The production program includes a wide range of light and combined oils, mayonnaise, sauces and mustard.

To produce all types of products, company uses the most advanced technological processes, which allow to obtain products that meet the requirements of international standards.

«Vista» is a top and respected Ukrainian producer of mayonnaise, sauces, condensed milk, vegetable creams, margarines and spreads. The company has been on the market for over 24 years and combines leading technologies with Ukrainian traditions.

«Vista» LLC logo is presented in Fig. 2.1.

Figure 2.1 – «Vista» LLC logo

The company «Vista» develops various types of mayonnaise and sauces according to the specific requirements of the customer: HoReCa, cooking, catering companies.

The main factor for the success of company's products is ecologically clean and natural Ukrainian raw materials. Company owners love their business, and do it with all their heart and they are proud that people can enjoy a natural and healthy product. And when products are combined with Ukrainian service and hospitality – it is a guaranteed success for the business!

The «Vista» LLC plant is located near Kiev, in the picturesque town of Vorzel. But the company's products are known and loved not only in Kyiv, but also in all regions of Ukraine. This became possible thanks to a wide distribution network, which ensures the availability of goods in the right place at a time convenient for the consumer.

«Vista» LLC organizational structure is presented in Fig. 2.2.

Company marketers constantly collect, analyze and forecast information about the market and its individual elements, which allows us to organize production taking into account consumer demand. And affordable prices, a flexible system of discounts and delivery of products by our own transport open up broad prospects for joint activities with wholesale buyers in all regions of Ukraine.

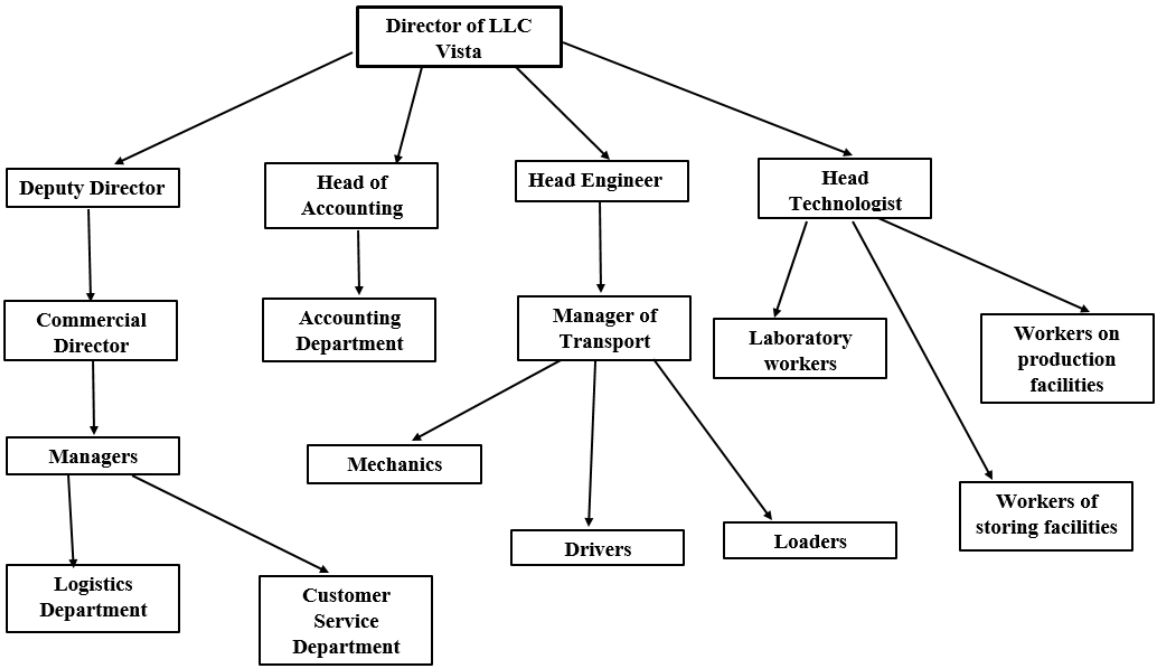

Figure 2.2 – «Vista» LLC organizational structure

«Vista» LLC is constantly pursuing the modernization of production, systematically expanding and rebuilding it. In 2021, a new technological complex was installed for mayonnaise production.

For the production of products, equipment is used, partly Ukrainian, partly imported. The introduction of new modern lines into operation and the use of advanced technologies allows us to produce products of high European quality, while maintaining affordable prices for consumers.

«Vista» LLC has its own physicochemical and bacteriological laboratories, equipped with the latest technology, to carry out both incoming control of raw materials and all indicators of finished products.

Company use extremely high quality raw materials to produce the entire range of products. During production, special attention is paid to the quality of water, as it affects the taste of the product and its microbiological purity. Water is extracted from a well 125 meters deep. Water safety is ensured by removing or reducing to the minimum possible concentration of water components that may be hazardous to health (various harmful impurities, chemical and bacterial contaminants). Accumulating in the human body, impurities contained in water weaken the immune

system, increase the risk of allergies, and contribute to the development of many serious diseases.

The enterprise has installed an effective 4-level water purification using filter cartridges, a water softening system and an ultraviolet UV water disinfection system. We can say with confidence that the finished products of «Vista» LLC use harmless, absolutely clean water, free from any impurities and contaminants.

«Vista» company has experienced, qualified personnel who are able to implement the production program and ensure the sale of manufactured products. Constant development and advanced training of employees abroad helps us not to rest on our laurels, improving the quality of products, launching the production of new types of products, and conquering new market segments.

High quality and low prices allow us to confidently compete with foreign and domestic manufacturers of similar products. Company is interested in expanding the sales market and will always be reliable business partners.

This service provides for the manufacture of products of the major trading companies of the Ukrainian market under their brands. Successful passing of audits and tenders once again confirms the high quality of products of TM «Vista» and conformity of production to the highest standards. [41]

«Vista» LLC customers are presented in Fig. 2.3.

Figure 2.3 – "Vista" LLC customers

«Vista» LLC (EDRPOU code 13734034) was registered on 04/05/1994, The company operates at the place of registration at the address: 08296, Kyiv region, Buchanskyi district, Vorzel township, str. Klenova, building 31 and is engaged in the production of food products: production of spices and seasonings KVED 10.84, production of condensed milk KVED 10.51, production of margarine and similar edible fats KVED 10.42, production of spreads KVED 10.89, etc.

«Vista» LLC uses land plots located at the address of the village Vorzel, str. Klenova, 31 and 31a.

"Vista" LLC is the owner of the real estate located on the given land areas:

– building, workshop with a total area of 475.8 square meters;

– a part of the workshop with a total area of 648.8 sq.m.

The company also rents non-residential premises (shop building, warehouse) 540.1 sq.m. at the address of the village of Vorzel, str. Klenova, building 31.

For carrying out economic activity, the company's balance sheet includes fixed assets in the amount of UAH 9,228.8 thousand, incl. refrigeration equipment, equipment for making mayonnaise and sauces, margarines, spreads, condensed milk, chemical and bacteriological laboratory equipment, transport, etc.

On November 1, 2023 according to the staff list, 106 people work at «Vista» LLC, which fully meets the company's need for labor resources. The monthly wage fund is UAH 1,094,600.00.

Types of economic activity:

10.84 Manufacture of spices and seasonings (main)

10.42 Manufacture of margarine and similar edible fats

10.51 Milk processing, butter and cheese production

10.52 Production of ice cream

10.86 Production of baby food and dietary food products

46.33 Wholesale trade of dairy products, eggs, edible oils and fats

46.38 Wholesale trade of other foodstuffs, including fish, crustaceans and mollusks

46.39 Non-specialized wholesale of food, beverages and tobacco

47.11 Retail sale in non-specialized stores mainly of food, beverages and tobacco

47.81 Retail sale of food, beverages and tobacco products from stands and markets

49.41 Freight road transport

68.20 Leasing and exploitation of own or leased real estate

10.89 Manufacture of other food products, etc.

2.2 Analysis of the economic and financial state of the enterprise`s activity

To maintain a stable trend in the development of financial and economic activities of the enterprise in the conditions of constant aggravation of competitive struggle, it is necessary to reliably assess the financial condition of the enterprise. The financial condition of the company characterizes the provision of its own working capital, the optimal ratio of inventory to production needs, as well as timely settlement operations and solvency.

An assessment of the company's financial condition shows in which specific areas this work needs to be done. Accordingly, the results of the analysis provide an answer to the question of what are the most important ways to improve the financial condition of the enterprise in a particular period of its activity.

In order to study the methodological aspects of the analysis of the financial condition of the enterprise was conducted analysis of current and non-current assets for 2019-2023 period in Table 2.1 and analysis of deviation during five years' period was conducted in Table 2.2.

Thus, the analysis of the financial condition of «Vista» LLC showed that for 2019-2023, the intangible assets of the company tend to decrease, the highest percentage of decreasing was observed in 2022 (18,35%) -2023 (26,36 %) period.

Table 2.1 – Current and Non-Current assets analysis of «Vista» LLC

Assets	2019	2020	2021	2022	2023
I. Non-current assets					
Intangible assets	16.1	16.1	15.8	12.9	9.5
initial value	28.2	28.2	30.5	30.5	30.5
accumulated depreciation	12.1	12.1	14.7	17.6	21
Unfinished capital investments	1666.9	3672.7	3974.1	3775.4	3576.7
Fixed assets:	1628.8	3184.7	3468.9	3710.9	3964.2
initial value	5137.5	7232.2	8163.5	8888.5	9870.4
Long-term financial investments	9.2	9.2	9.2	9.2	9.2
All according to section I	2821	6882.7	7468	7508.4	7559.6
II. Current assets					
Stocks:	5864.2	7435.1	11311.9	15229.5	17799.9
including finished products	1311.4	1707.3	3350.5	3376.4	2311.6
Accounts receivable for products, goods, works, services	9534.6	15042.5	29708.5	26071.9	30825.8
Money and its equivalents	1943.6	1199.7	388.1	719.5	629.9
Other current assets	37.7	129.1	253.2	180.3	211.5
All according to section II	18842.3	23806.4	41401	42201.2	49496.7
Balance	21663.3	30689.1	49169	49709.6	57056.3

Table 2.2 – Deviation of Current and Non-Current assets of «Vista» LLC

Deviation 2020-2019		Deviation 2021-2020		Deviation 2022-2021		Deviation 2023-2022	
absolute Thsd UAH	relative (%)	absolute Thsd UAH	relative (%)	absolute Thsd UAH	relative (%)	absolute Thsd UAH	relative (%)
1	2	3	4	5	6	7	8
0	0	-0.3	-1.86	-2.9	-18.35	-3.4	-26.36
0	0	2.3	8.16	0	0.00	0	0.00
0	0	2.6	21.49	2.9	19.73	3.4	19.32
2005.8	120.33	301.4	8.21	-198.7	-5.00	-198.7	-5.26
1555.9	95.52	284.2	8.92	242	6.98	253.3	6.83
2094.7	40.77	931.3	12.88	725	8.88	981.9	11.05
0	0.00	0	0.00	0	0.00	0	0.00
4061.7	143.98	585.3	8.50	40.4	0.54	51.2	0.68
1570.9	26.79	3876.8	52.14	3917.6	34.63	2570.4	16.88
395.9	30.19	1643.2	96.25	25.9	0.77	-1064.8	-31.54
5507.9	57.77	14666	97.50	-3636.6	-12.24	4753.9	18.23
-743.9	-38.27	-811.6	-67.65	331.4	85.39	-89.6	-12.45
91.4	242.44	124.1	96.13	-72.9	-28.79	31.2	17.30
4964.1	26.35	17594.6	73.91	800.2	1.93	7295.5	17.29
9025.8	41.66	18479.9	60.22	540.6	1.10	7346.7	14.78

Changes in market conditions or a reassessment of intangible assets' value may lead to a revaluation of these assets.

Intangible assets such as licenses or patents may expire over time, leading to a decrease in their value.

Accumulated depreciation has a tendency to grow steadily: 2020 year – 21,49%, 2021 year – 19,73%, 2023 year – 19,32 %. As a company uses its fixed assets (such as buildings, machinery, equipment), they are subject to wear out over time. Depreciation is recognized as an expense to allocate the cost of these assets over their estimated useful lives. An increase in accumulated depreciation reflects that more depreciation expense has been recorded on the assets during the period.

Fixed assets of «Vista» LLC are growing; the highest percentage of growth was in 2020 year (40,77%) because company acquiesced new assets. It was purchasing of new equipment, machinery, vehicles, real estate to expand operations, improve efficiency, or upgrade existing infrastructure, then in 2021-2023 period value was increasing steadily.

In Current assets section Stocks were increasing steadily, but in 2021 was sharp increase on 52,14%, that value shows that physical inventory of goods or products held by a company increased. This type of growth happened due to increasing of production levels, excessive purchasing, higher customer demand and increasing of working facilities due to purchasing of new manufacturing equipment.

Accounts receivable for products, goods, works, services have a tendency to grow, meaning that a company has made sales on credit to customers, but the payment for those sales has not yet been received. Accounts receivable represent the amount of money owed to a company by its customers for goods sold or services rendered on credit terms. But in 2022 this value decreased on 12,24%, indicating that the outstanding amount owed to a company by its customers has been reduced, due to war conditions.

For 2019-2023 period balance of «Vista» company had grown meaning that the company is making more sales on credit, which can lead to higher revenue and business expansion, also an increase in the customer base or market share, as more customers are purchasing goods or services from the company.

Analysis of «Vista» LLC company liabilities are presented in Table 2.3 and 2.4.

Table 2.3 – Analysis of «Vista» LLC company liabilities

Liabilities	2019	2020	2021	2022	2023
I. Net worth					
Registered (share) capital	2000,0	2000,0	2000,0	2000,0	2000,0
Reserve capital	23,0	23,0	23,0	23,0	23,0
Retained earnings (uncovered loss)	12090	20635.9	31610.1	40504.8	46732
All according to section I	14113	22658.9	33633.1	45527.8	48755
II. Current liabilities					
Current accounts payable for:					
goods, works, services	3227.2	5625.5	13020.5	4335.4	6182.6
calculations with the budget	904.2	1054.8	1186.2	1445.7	731
including income tax	628.3	643.8	787	776.7	395.8
insurance calculations	81.9	49.1	76.1	69.8	84.7
payment calculations	361.6	263	367.4	342.7	399.5
Other current commitments	2975.2	1037.8	885.7	978.2	903.5
All according to section II	7550.1	8030.2	15535.9	7181.8	8301.3
Balance	21663.3	30689.1	49169	49709.6	57056.3

Table 2.4 – Deviation of «Vista» LLC company liabilities

Deviation 2020-2019		Deviation 2021-2020		Deviation 2022-2021		Deviation 2023-2022	
absolute Thsd UAH	relative (%)	absolute Thsd UAH	relative (%)	absolute Thsd UAH	relative (%)	absolute Thsd UAH	relative (%)
1	2	3	4	5	6	7	8
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
8545.7	70.68	10974.2	53.18	8894.7	28.14	6227.2	15.37
8545.7	60.55	10974.2	48.43	11894.7	35.37	3227.2	7.09
2398.3	74.32	7395	131.45	-8685.1	-66.70	1847.2	42.61
150.6	16.66	131.4	12.46	259.5	21.88	-714.7	-49.44
15.5	2.47	143.2	22.24	-10.3	-1.31	-380.9	-49.04
-32.8	-40.05	27	54.99	-6.3	-8.28	14.9	21.35
-98.6	-27.27	104.4	39.70	-24.7	-6.72	56.8	16.57
-1937.4	-65.12	-152.1	-14.66	92.5	10.44	-74.7	-7.64
480.1	6.36	7505.7	93.47	-8354.1	-53.77	1119.5	15.59
9025.8	41.66	18479.9	60.22	540.6	1.10	7346.7	14.78

During 2019-2023 period, registered share capital of a company remains the same. It means that the total amount of capital that the company is authorized to raise through the issuance of shares has not changed. This registered share capital is the

maximum amount of capital that the company is legally allowed to raise by issuing shares to its shareholders.

During 2019-2023 period retained earnings (uncovered loss) increase. In 2020 was sharp increase on 70,68%, and the next years continued these tendencies. It means that the accumulated losses of a company have grown over a specific period. Retained earnings, also known as accumulated earnings or accumulated deficit, represent the cumulative net income or loss that a company has retained since its inception after paying dividends to shareholders.

Current accounts payable for goods, works, services increase for 2019-2021 period. In 2021 was sharp increase on 131,45 % it means that the amount of money owed by a company to its suppliers, vendors, or service providers has gone up. Accounts payable represent the short-term obligations that a company has to pay for goods purchased, services rendered, or work completed but not yet paid for. But for 2022 this value decreased on 66,70%, indicating that the amount of money owed by a company to its suppliers, vendors, or service providers has gone down. Accounts payable represent the short-term obligations that a company has to pay for goods purchased, services rendered, or work completed but not yet paid for.

Current accounts payable for calculations with the budget has tendency to grow for 2019-2022 period. An increase in accounts payable may prompt the company to revise its budget projections. The company need to adjust its forecasted expenses and cash flow projections to account for the higher-than-expected liabilities and ensure that sufficient funds are available to meet its obligations. An increase in accounts payable may impact the company's working capital management. It may indicate that the company is taking longer to pay its suppliers, which could strain relationships and potentially result in late payment penalties or strained supplier relationships. In 2023 was observed sharp decline on 49,44% it can signal better working capital management. It indicates that the company is paying its obligations on time or early, reducing the risk of late payment penalties and enhancing its financial stability.

Current accounts payable for including income tax for 2019-2021 period had clear tendency to grow, in 2019 this indicator was 628,3 thousand UAH, 2020-year

indicator was 643,8 thousand UAH (increased on 2,47%), in 2021 indicator was 787 thousand UAH (increased on 22,24%). For 2022-2023 period indicator started to decrease indicating that lowering income tax liabilities in accounts payable reduces the financial risk for the company. It decreases the potential for penalties, interest charges, and other consequences of non-payment or late payment of taxes.

Current accounts payable for insurance do not have clear tendency, because in 2019 this measure was 81,9 thousand UAH, then in 2020 sharp decline on 40,05% was indicated. In 2021 this value increased on 54,99%, meaning that it can result in a positive budget variance. This indicates that the company's actual insurance expenses are lower than anticipated, potentially leading to cost savings or improved financial performance, in 2022 again was observed decreasing period on 8,28%. In 2023 current accounts payable for insurance calculations increased on 21,35% indicating that it can result in a negative budget variance. This means that the company's actual insurance expenses are higher than anticipated, potentially leading to a shortfall in the budget.

Current accounts payable for payment calculations do not have clear tendency, because in 2019 this indicator was 361,6 thousand UAH, then in 2020 this value sharply decreased on 27,27% and became 263 thousand UAH, indicating that the company has less outstanding debt to pay, resulting in improved cash flow. This can free up cash for other business needs, such as investments, expansion, working capital. In 2021 this value increased on 39,70% and became 367,4 thousand UAH, meaning that the company has more outstanding debt to pay. This can put a strain on cash flow and liquidity, as the company need to allocate more resources to meet its payment obligations. For 2022-2023 this indicator remained almost unchanged indicating that company continues facing the same issues.

For 2019-2023 period balance of «Vista» company had grown meaning that the company is making more sales on credit, which can lead to higher revenue and business expansion, also an increase in the customer base or market share, as more customers are purchasing goods or services from the company.

Analysis of main customers for 2021-2023 period are presented in Table 2.5.

Table 2.5 – Analysis of main customers for 2021-2023 period

Customer Name	Percentage in purchase in 2021		Percentage in purchase in 2022		Percentage in purchase in 2023		Subject of Purchase	The Term of Cooperation
	thsd UAH	%	thsd UAH	%	thsd UAH	%		
1	2	3	4	5	6	7	8	9
LLC "FOZZY Commerce"	18 094,5	12,1	14769,7	16,4	16046,3	13,4	Ketchups, sauces, mayonnaise	10 months
LLC "SILPO FOOD"	77 899,4	52,1	51741,1	57,5	63518,2	53,1	Ketchups, sauces, mayonnaise	6 years
LLC "Fora"	12 022,9	8	2559,4	2,8	6357,9	5,3	Ketchups, sauces, mayonnaise	1 year 9 months
LLC "Key FOOD"	9878,6	6,6	5292	5,9	8951,4	7,5	Ketchups, sauces, mayonnaise	9 years
Others	31594,4	21,1	20951,8	23,3	24816,2	20,7	-	-
Total	149490	100	90022	100	119690	100	-	-

Based on given data, could be conducted that customer who gives the highest amount of profit is LLC "SILPO FOOD". For 2021 this value was 77899,4 thousand UAH, 2022 – 51741,1 thousand UAH, 2023 – 63518,2 thousand UAH. Also these company occupies more than a half in total percentage in total purchase (2021 – 52,1%, 2022-57,5%, 2023 -53,1%).

Second largest customer is LLC "FOZZY Commerce", for 2021 its percentage in purchase was 18094,5 thousand UAH (12,1%), 2022 – 14769,7 thousand UAH (16,4%), 2023 – 16046,3 thousand UAH (13,4%). There are other customers which occupy almost equal parts in total percentage in purchase its LLC "Fora" and LLC "Key FOOD".

For 2021 LLC "Fora" percentage in purchase was 12022,9 thousand UAH (8%), for 2022, percentage was extremely low 2559,4 thousand UAH (2,8%), but in 2023 percentage increased to 6357,9 thousand UAH (5,3%).

LLC "Key FOOD" percentage for 2021 was 9878,6 thousand UAH (6,6%), 2022 – 5929 thousand UAH (5,9%), 2023 – 8951,4 thousand UAH (7,5%). Other customers bring LLC Vista 31594,4 thousand UAH and occupy 21,1% in percentage of purchase in 2021, for 2022 this value decreased and its amount was 20951,8 thousand UAH and 23,3% from purchase. Total profit for 2021 was 149490 thousand UAH, for 2022 year – these value decreased on 39,78 % and became 90022 thousand UAH. In 2023 year, total profit in purchases increased on 32,96% and became 119690 thousand UAH.

Analysis of main suppliers for 2021-2023 period is presented in Table 2.6.

Based on given data, could be conducted that supplier which requires the biggest amount of money on procurement of raw material for manufacturing, such as refined sunflower oil is sole trader "Skyba M.A. ". For 2021 this value was 32369,3 thousand UAH, 2022 – 25447,8 thousand UAH, 2023 – 26518,4 thousand UAH. Also these company occupies more than 30% in total percentage in total procurement (2021 – 36,5%, 2022-40,1%, 2023 -37,2%).

Table 2.6 – Analysis of main suppliers for 2021-2023 period

Supplier Name	Percentage in supply in 2021		Percentage in procurement in 2022		Percentage in procurement in 2023		Subject of Supply	The Term of Cooperation
	thsd UAH	%	thsd UAH	%	thsd UAH	%		
1	2	3	4	5	6	7	8	9
LLC "Smakoliya"	12081,5	13,6	15887,7	25	16405,7	23	Refined sunflower oil	1 year 3 months
LLC "Komora OPT"	5033,4	5,7	6387,3	10,1	4856,2	6,8	Fats	6 years 8 months
Sole trader "Skyba M.A. "	32369,3	36,5	25447,8	40,1	26518,4	37,2	Refined sunflower oil	4 years
LLC "Gurman Trade"	7159,3	8,1	1082,4	1,7	4186,8	5,9	Tomato paste	8 years 6 months
Others	32162,5	36,1	14686,2	23,1	19393,9	27,2	-	-
Total	88806	100	63492,1	100	71361	100	-	-

Second largest supplier of refined sunflower oil is LLC "Smakoliya", for 2021 its percentage in procurement was 12081,5 thousand UAH (13,6%), 2022 – 15887,7 thousand UAH (25%), 2023 – 16405,7 thousand UAH (23%). There are other customers which occupy almost equal parts in total percentage in procurement its LLC "Komora OPT" and LLC "Gurman Trade".

For 2021 LLC "Komora OPT" percentage in supply of fats was 5033,4 thousand UAH (5,7%), for 2022– 6387,3 thousand UAH (10,1%), but in 2023 percentage decreased to 4856,2 thousand UAH (6,8%).

LLC "Gurman Trade" percentage in supply of tomato paste for 2021 was 7159,3 thousand UAH (8,1%), 2022 – 1082,4 thousand UAH (1,7%), 2023 – 4186,8 thousand UAH (5,9%). On supply operations from other customers LLC Vista spent 32162,5 thousand UAH and this value occupy 36,1% in percentage of supply in 2021, for 2022 this value decreased and its amount was 14686,2 thousand UAH and 23,1% from total percentage of supply, in 2023 – 19393,9 thousand UAH and 27,2%. Total amount of money that was spent on supply operations for 2021 was 88806 thousand UAH, for 2022 year – these value decreased on 28,5 % and became 63492,1 thousand UAH. In 2023 year, total profit in purchases increased on 12,39% and became 71361 thousand UAH.

Based on a data given in Table 2.7 and Table 2.8, could be conducted that for 2022 period quantity of ketchup and tomato sauces decreased on 44,6% in comparison with 2021, also number of sold products produced from own raw materials decreased on 44,58 % indicating that there is small demand on such type of product, so company shortened facilities on its production. Also the cost of sold products produced from own raw materials decreased on 6130,8 thousand UAH (16,23%), meaning that company losing profit due to decreasing manufacture of products from its own raw materials.

Quantity of produced sauces and products for preparing sauces; other mixed seasonings and spices in 2022 decreased on 36,56% and became 767,6 tonnes.

Table 2.7 – Analysis of sold production for 2021-2023 period

The name of the type of product according to the Nomenclature of Industrial Products (NPP)	Un. of measure	2021			2022			2023		
		Quantity of products produced (gross production)	The number of sold products produced from own raw materials	The cost of sold products produced from own raw materials, thousand UAH	Quantity of products produced (gross production)	The number of sold products produced from own raw materials	The cost of sold products produced from own raw materials, thousand UAH	Quantity of products produced (gross production)	The number of sold products produced from own raw	The cost of sold products produced from own raw
Other ketchup and tomato sauces	t	1012	1002	37767	560.58	555.3	31636.2	654.66	656.35	38127.2
The mustard ready for use	t	59	58	2118.5	34.54	36.8	1557.5	45.51	45.02	2161
Sauces and products for preparing sauces; other mixed seasonings and spices (except soy sauce, ketchup and other tomato sauces, mustard flour and powder, ready-made mustard)	t	1210	1182	49166.9	767.6	794.7	38016.4	656.37	328.02	32977.7
Spreads with a mass fraction of total fat from 50% to 85%, including milk fat in the fat phase of not less than 25%, and fat mixtures with a mass fraction of total fat of not less than 99.0%, including milk fat in the fat phase not less than 25%	t	141	138	6839.3	85.35	88.2	6829.7	65.18	68.92	7106.1
Margarine and paste-like products with reduced or low content fats (except liquid margarine)	t	2	2	118.9	3.1	3.1	124.6	1.85	2.26	125.8
Processed cheese (except grated or powdered)	t	78	84	4071.1	57.1	60.3	2922.4	64.8	65.7	3184.1
Sweetened condensed milk and cream	t	187	192	6965.4	45.8	46.8	1724	83.8	83.03	6086.6

Table 2.8 – Deviation of sold production for 2021-2023 period

The name of the type of product according to the Nomenclature of Industrial Products (NPP)	Unit of measurement	Deviation 2022-2021			Deviation 2023-2022		
		Quantity of products produced (gross production)	The number of sold products produced from own raw materials	The cost of sold products produced from own raw materials, thousand UAH	Quantity of products produced (gross production)	The number of sold products produced from own raw materials	The cost of sold products produced from own raw materials, thousand UAH
Other ketchup and tomato sauces	t	-451.42	-446.7	-6130.8	94.08	101.05	6491
The mustard ready for use	t	-24.46	-21.2	-561	10.97	8.22	603.5
Sauces and products for preparing sauces; other mixed seasonings and spices (except soy sauce, ketchup and other tomato sauces, mustard flour and powder, ready-made mustard)	t	-442.4	-387.3	-11150.5	-111.23	-439.58	-5038.7
Spreads with a mass fraction of total fat from 50% to 85%, including milk fat in the fat phase of not less than 25%, and fat mixtures with a mass fraction of total fat of not less than 99.0%, including milk fat in the	t	-55.65	-49.8	-9.6	-20.17	-19.28	276.4
Margarine and paste-like products with reduced or low content fats	t	1.1	1.1	5.7	-1.25	-0.84	1.2
Processed cheese (except grated or powdered)	t	-20.9	-23.7	-1148.7	4.5	5.4	261.7
Sweetened condensed milk and cream	t	-141.2	-145.2	-5241.4	38	36.23	4362.6

Number of sold products produced from own raw materials decreased on 32,76% and became 794,7 tonnes. The cost of sold products produced from own raw materials decreased on 11150,5 thousand UAH (22,67%).

Quantity of produced spreads in 2022 decreased on 39,46% and obtain 85,35 tonnes. The number of sold products produced from own raw materials decreased on 36,08% and was 88,2 tonnes.

Quantity of produced margarine and paste-like products increased in 2022 for 55% and became 3,1 tonnes. The cost of sold products produced from own raw materials increased on 5,7 thousand UAH (4,79%), indicating that demand on this type of product increased and company increased its production number.

Quantity of processed cheese product decreased on 26,79% (20,9 tonnes). The number of sold products produced from own raw materials decreased on 28,21% and was 60,3 tonnes. The cost of sold products produced from own raw materials decreased on 1148,7 thousand UAH (28,21%).

Quantity of produced sweetened condensed milk and cream in 2022 increased on 82,96% and became 83,8 tonnes, indicating that demand on such type of goods increased, so company manufacture more batches. The number of sold products produced from own raw materials increased on 77,42% and obtain 83,03 tonnes. The cost of sold products produced from own raw materials increased on 4362,6 thousand UAH (75,24%), indicating that demand on this type of product decreasing and company decreasing number of its manufacture.

For 2023 period quantity of ketchup and tomato sauces increased on 16,78% (94,08 tonnes) in comparison with 2022. The number of sold products produced from own raw materials increased on 18,19 % (101,05 tonnes) indicating that demand on such type of product increased, so company put more facilities on its production. Also the cost of sold products produced from own raw materials increased on 6491 thousand UAH (20,52%), meaning that company earning more profit due to increasing manufacture of products from its own raw materials.

Quantity of produced mustard in 2023 increased on 31,76% and became 45,51 tonnes. Number of sold products produced from own raw materials increased on

22,34% and became 45,02 tonnes. The cost of sold products produced from own raw materials increased on 603,5 thousand UAH (38,75%).

Quantity of produced sauces and products for preparing sauces; other mixed seasonings and spices in 2023 decreased on 14,49 % and became 767,6 tonnes. Number of sold products produced from own raw materials decreased on 58,72% and became 328,02 tonnes. The cost of sold products produced from own raw materials decreased on 5038,7 thousand UAH (13,25%).

Quantity of produced spreads in 2023 decreased on 23,63% and obtain 65,18 tonnes. The number of sold products produced from own raw materials decreased on 21,86% (19,28 tonnes) and was 68,92 tonnes.

Quantity of produced margarine and paste-like products decreased in 2023 for 40,32% and became 1,85 tonnes. The number of sold products produced from own raw materials decreased on 27,1% (0,84 tonnes) and became 2,26 tonnes. The cost of sold products produced from own raw materials increased on 1,2 thousand UAH, indicating that company used stocks of early produced goods rather than produce new batches.

Quantity of processed cheese product increased on 13,49% (4,5 tonnes). The number of sold products produced from own raw materials increased on 8,96% and was 65,7 tonnes. The cost of sold products produced from own raw materials increased on 261,7 thousand UAH (8,95%).

Quantity of produced sweetened condensed milk and cream in 2023 increased on 75,5% and became 45,8 tonnes. The number of sold products produced from own raw materials decreased on 26,79% and was 57,1 tonnes. The cost of sold products produced from own raw materials decreased on 4362,6 thousand UAH (253,1%), indicating that demand on this type of product rapidly growing and company increasing number of sales.

Based on a data given in Table 2.7 and Table 2,8, could be conducted that for 2021 total mileage of trucks was 406,4 thousand kilometers, in 2022 this indicator decreased on 21,41% and became 319,4 thousand kilometers and in 2023 this value increased on 20,26% and obtain 384,1 thousand kilometers, indicating that company gets more orders than in 2022 year.

Table 2.9 – Effectiveness of transport usage for 2021-2023 period

Name of Indicators	2021			2022			2023			Deviation 2022-2021			Deviation 2023-2022		
	Trucks	Cars	Non-Passenge	Trucks	Cars	Non-Passenger	Trucks	Cars	Non-Passenge	Trucks	Cars	Non-Passenger cars	Trucks	Cars	Non-Passenger cars
Total mileage of vehicles (thds. km)	406.4	111.5	8.6	319.4	158.6	7.8	384.1	94.4	8.4	-87	47.1	-0.8	64.7	-64.2	0.6
Mileage of trucks with cargo	348.5	0	0	240.6	0	0	340.5	0	0	-107.9	0	0	99.9	0	0
Mileage of cars on gasoline	18.3	30.2	8.6	32.7	28.4	7.8	26.4	0	8.4	14.4	-1.8	-0.8	-6.3	-28.4	0.6
Mileage of cars on diesel	388.1	33.6	0	286.7	51.6	0	357.7	0	0	-101.4	18	0	71	-51.6	0
Volume of transported goods (thsd ton)	3.2	0	0	2.4	0	0	2.8	0	0	-0.8	0	0	0.4	0	0
Freight turnover thousand tkm	1115.2	0	0	766.6	0	0	1225.8	0	0	-348.6	0	0	459.2	0	0

In Table 2.9 effectiveness of transport usage for 2021-2023 period was presented.

Total mileage of cars was 348,5 thousand kilometers in 2021, in 2022 this indicator increased on 42,24% (47,1 thousand kilometers) and became 158,6 thousand kilometers and in 2023 this value decreased on 40,48% and was 94,4 thousand kilometers.

Mileage of trucks with cargo in 2021 was 348,5, in 2022 this indicator decreased on 30,96%, due to war conditions, in 2023 this value increased on 41,52% (99,9 thousand kilometers.

Mileage of cars on gasoline for trucks and cars was 48,5 thousand kilometers in 2021, in 2022 this value was 61,1 thousand kilometers, in 2023 indicator showed 26,4 thousand kilometers.

Mileage of cars on diesel for trucks and cars in 2021 was 421,7, in 2022 this value was 338,3, in 2023 – 357,7. Company owns more vehicles with diesel engines, because diesel fuel costs less and can reduce fuel expenses.

Volumes of transported goods for 2021-2023 period are presented in Fig. 2.4.

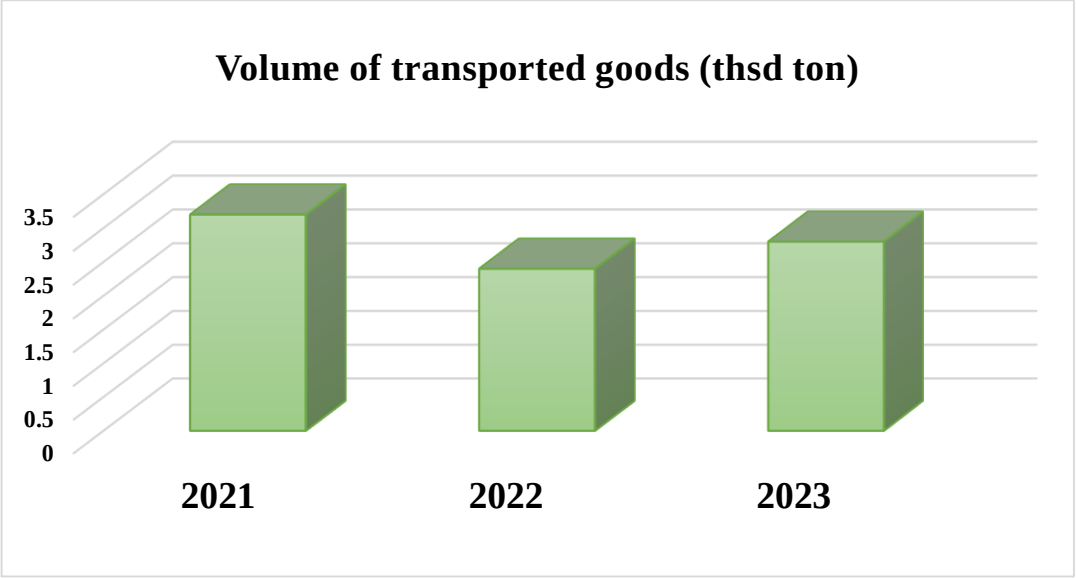

Figure 2.4 – Volume of transported goods for 2021-2023 period

During 2021-2023 period, the highest volume of transported goods 3,2 thousand tonnes was observed in 2021, in 2022 this indicator decreased on 25% and

became 2,4 thousand tonnes, in 2023 value increased on 16,7% in comparison with 2022 and became 2,8 thousand tonnes.

Freight turnover for 2021-2023 period is presented in Fig. 2.5.

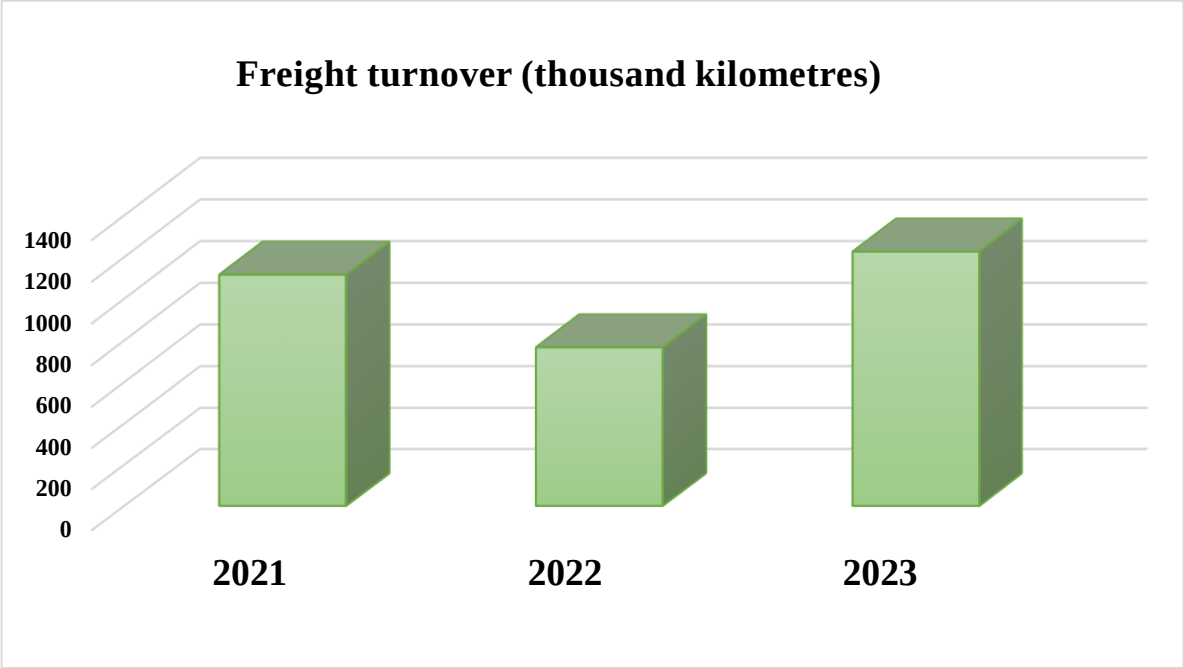

Figure 2.5 – Freight turnover for 2021-2023 period

During 2021-2023 period, the highest rate of freight turnover – 1225,8 thousand kilometers was observed in 2023. In 2022 this indicator decreased on 31,26% in comparison with 2021 and was lower on 37,46% (0,4 thousand kilometers) than freight turnover in 2023. In 2023 value increased on 59,9% in comparison with 2022 and became 1225,8 thousand kilometers.

2.3 Analysis of the supply chain of self-produced food products

Table 2.10 shows list of customers in South region of Ukraine and goods that should be delivered to their warehouses.

Table 2.10 – Chain of deliveries to customers for South region of Ukraine

Company name	Address	Type of delivered goods	Q-ty (pieces)	Weight (kg)
"TRASH LLC"	Odesa, pr-kt. Dobrovolskogo, 82b	Garlic sauce from 1 kg	6	6,27
		Caesar sauce bucket 1 kg	6	6,24
"SILPO-FOOD"	Odesa, street Armiyska, bldg. 11	Garlic sauce 1 kg	210	219,45
		Unagi sauce bucket 1 kg	168	174,72
		French mustard from 1 kg	60	62,4
		Tomato sauce 1 kg	144	149,76
		Tomato paste 25% 1 kg	120	124,8
		Remoulade sauce bucket 1 kg	18	18,72
		Mustard from 1 kg	24	24,96
"PROFESSIONAL 2017 LLC"	Odesa, st. Vapnyana, 54	Garlic DP sauce 2 kg	12	12,6
		Sauce Sweet DP 1 kg	8	8,432
		Garlic Sauce DP 40g	450	20,7
		Barbecue sauce DP 40g	90	4,14
		Sauce Spicy DP 40g	90	4,14
		Vista cheese sauce 40g	225	10,35
		Barbecue sauce DP pack 1 kg	180	183,6
		Spicy DP sauce 1 kg	4	4,16
		Sauce Sweet DP 50g	64	3,584
"Vakulenko Dmytro Arkadiyovych"	Mykolayiv, st. Dniprovska 4	Alfredo sauce 1 kg	5	5,2
		Garlic sauce 1 kg	2	2,09
		DP barbecue sauce 5 kg	1	5,272
"TRASH LLC"	Mykolaiv, avenue kt. Tsentralniy, 12/1	Garlic sauce 1 kg	12	12,54
		Remoulade sauce bucket 1 kg	24	24,96
		Caesar sauce bucket 1 kg	6	6,24
		Cheese sauce 1 kg	6	6,24
		Pizza sauce 1 kg	24	24,96
		Basil sauce bucket 1 kg	18	18,72
"Vakulenko Dmytro Arkadiyovych"	Odesa, st. Vilyamsa, 68/1	Alfredo sauce 1 kg	6	6,24
		Cheese sauce 1 kg	6	6,24
		DP barbecue sauce 1 kg	6	6,24
"PAK LLC"	Uman, st. Zavodska, 31	Pizza sauce 1 kg	12	12,54
		Garlic sauce 1 kg	2	2,09
"RIDO GROUP LLC"	Bila Tserkva, st. Mitrofanova, 8	Mayonnaise Provence 5 kg	4	21,088
		Tomato paste 25% 5 kg	1	5,272
		Cheese sauce 1 kg	2	2,08
		Total	**2016**	**1207.04**

For "TRASH LLC" in Odesa, quantity of delivered goods is 12 pieces which have weight 12,51 kilograms.

"SILPO-FOOD" ordered 744 pieces of different types of sauces with total weight 744,81 kilograms.

"PROFESSIONAL 2017 LLC" ordered delivery of 123 pieces of sauces with total weight 251,706 kilograms.

"Vakulenko Dmytro Arkadiyovych" company located in Mykolaiv, ordered 8 pieces with weight of 12,562 kilograms.

"TRASH LLC" in Mykolaiv, quantity of delivered goods is 90 pieces with total weight 93,66 kilograms.

"Vakulenko Dmytro Arkadiyovych" company in Odesa, ordered 18 pieces of sauces with total weight 18,72 kilograms.

"PAK LLC" ordered 14 pieces with total weight 14,63 kilograms.

"RIDO GROUP LLC" purchased 5 pieces with weight 28,44 kilograms. Total number of manufactured goods delivered to customers obtained 2016 pieces and 1207,04 kilograms.

Scheme of optimal route according to customer's location coordinates is presented in Fig. 2.6.

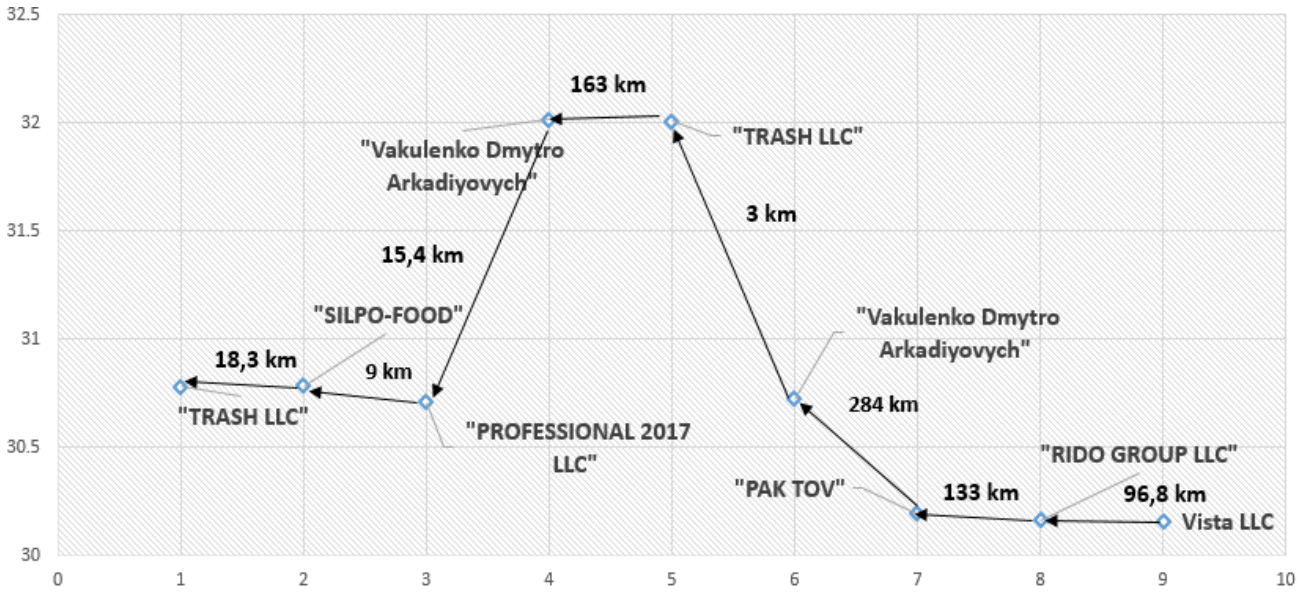

Figure 2.6 – Scheme of optimal route according to customer's location coordinates

The optimal route for delivery chain of delivery from Vorzel to Odesa will be follows:

1. Vista LLC (Vorzel, Klenova, 31) – Manufacturer
2. "RIDO GROUP LLC"(Bila Tserkva, st. Mytrofanova, 8)
3. "PAK LLC" (Uman, st. Zavodska, 31)
4. "Vakulenko Dmytro Arkadiyovych" (Mykolayiv, st. Dniprovska 4)
5. "TRASH LLC" (Mykolaiv, avenue kt. Tsentralniy, 12/1)
6. "Vakulenko Dmytro Arkadiyovych" company (Odesa, st. Vilyamsa, 68/1)
7. "PROFESSIONAL 2017 LLC"(Odesa, st. Vapnyana, 54)
8. "SILPO-FOOD" (Odesa, street Armiyska, bldg. 11)
9. "TRASH LLC" (Odesa, pr-kt. Dobrovolskogo, 82b)

Total mileage for these chain of delivery will be 722,5 kilometres with delivered 2016 pieces of sauces with total weight 1207,04 kilograms.

Table 2.11 shows list of customers in Central region of Ukraine and goods that should be delivered to their warehouses.

"Anodin Andrii Mykhailovych" company, quantity of delivered goods is 30 pieces which have weight 150 kilograms.

"INTEGRA TORG LTD" ordered 12 pieces of different types of sauces with total weight 12,48 kilograms.

"Legion 2015 LLC" purchased 19 pieces with weight 66,312 kilograms.

"RIDO GROUP LLC" ordered delivery of 6 pieces of sauces with total weight 31,632 kilograms.

"RELAYS COMPANY LTD" company ordered 31 pieces with weight of 87,526 kilograms.

For "RIDO GROUP LLC", quantity of delivered goods is 7 pieces with total weight 15,774 kilograms.

"IVA-GROUP LLC" ordered 28 pieces of sauces with total weight 147,616 kilograms.

"PANINI POINT-UKRAINE LLC" ordered 3 pieces with total weight 31,47 kilograms.

Table 2.11 – Chain of deliveries to customers for Central region of Ukraine

Company name	Address	Type of delivered goods	Q-ty (pieces)	Weight (kg)
"Anodin Andrii Mykhailovych"	Kyiv, Litovsky prospect, 5	Spr 50% mon 5kg	30	150
"INTEGRA TORG LTD"	Kyiv, st. Degtyarivska, 38/44,	French mustard 1 kg	2	2,08
		Mustard 1 kg	10	10.4
"Legion 2015 LLC"	Kyiv, pr. Povitroflotskyi, 19 A/1	Ketch Gentle 5 kg.	4	21,088
		Remoulade sauce bucket 1 kg	4	4,16
		Mustard 1 kg	3	3,12
		May Euro 5 kg	7	36,904
		Adjika 1 kg bucket	1	1,04
"RIDO GROUP LLC"	Kyiv, str. Avtozavodska, 27	Ketchup Gentle 5 kg	6	31,632
"RELAYS COMPANY LTD"	Kyiv, st. Surikova, building 3A	Mayonnaise Provence 5 kg	8	42,176
		Tomato paste 25% 5 kg	5	26,36
		Caesar sauce bucket 1kg	18	18,72
"RIDO GROUP LLC"	Kyiv, st. Nemyrovycha-Danchenko, 30	Ketchup Gentle 5 kg	2	10,544
		Alfredo sauce 1 kg	1	1,04
		Adjika 1 kg bucket	2	2,08
		Mustard 1 kg	2	2,08
"TVA-GROUP LLC"	Kyiv, str. Novozabarska, 21	Tomato paste 25% 5 kg	10	52,72
		Mayonnaise Provence 5 kg	15	79,08
		Ketchup Gentle 5 kg	3	15,816
"PANINI POINT-UKRAINE LLC"	Kyiv, st. Pryrichna, 21a	Adjika 10 kg	1	10,49
		Caesar sauce bucket 10 kg	1	10,49
		Sauce Garlic DP 10 kg	1	10,49
"LEVAYS LLC"	Kyiv, pr. Peremogy, 67	Mayonnaise Provence 5 kg	10	52,72
		Caesar sauce bucket 1 kg	18	18,72
"LEVAYS LLC"	Kyiv, st. Vadyma Hetmana, 6	Mayonnaise Provence p/e 190g	50	10,1
		Tomato paste 25% 5 kg	4	21,088
		Alfredo sauce 1 kg	3	3,12
		Caesar sauce bucket 1 kg	30	31,2
"BARREN COMPANY LLC"	Kyiv, st. Naberezhno-Lugova,8	Mayonnaise Euro 5 kg	20	105,44
		Tomato paste 25% 5 kg	5	26,36
		Mustard sauce (France) 1 kg	4	4,16
		Barbecue sauce DP 1 kg	10	10,2
		Total	**290**	**895,618**

"LEVAYS LLC" purchased 28 pieces with weight 71,44 kilograms.

"LEVAYS LLC" ordered delivery of 87 pieces of sauces with total weight 65,508 kilograms.

"BARREN COMPANY LLC" company ordered 39 pieces with weight of 146,16 kilograms.

Total number of manufactured goods delivered to customers obtained 290 pieces and 895,618 kilograms.

Scheme of optimal route according to customer's location coordinates is presented in Fig. 2.7.

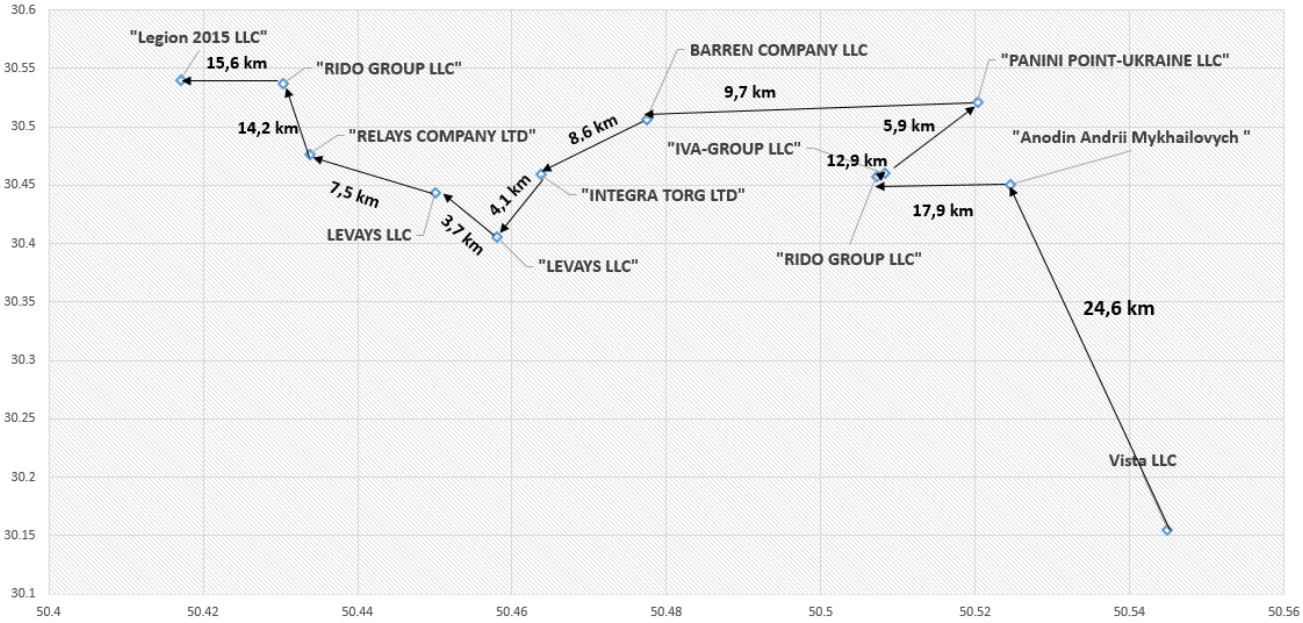

Figure 2.7 – Scheme of optimal route according to customer's location coordinates

The optimal route for delivery chain of delivery from Vorzel to Kyiv will be follows:

Vista LLC (Vorzel, Klenova, 31) – Manufacturer

"Anodin Andrii Mykhailovych" (Kyiv, Litovsky prospect, 5)

"RIDO GROUP LLC" (Kyiv, st. Nemyrovycha-Danchenko, 30)

"IVA-GROUP LLC" (Kyiv, str. Novozabarska, 21)

"PANINI POINT-UKRAINE LLC" (Kyiv, st. Pryrichna, 21a) "BARREN COMPANY LLC" (Kyiv, st. Naberezhno-Lugova, 8)

"INTEGRA TORG LTD" (Kyiv, st. Degtyarivska, 38/44)

"LEVAYS LLC" (Kyiv, pr. Peremogy, 67)

"LEVAYS LLC" (Kyiv, st. Vadyma Hetmana, 6)

"RELAYS COMPANY LTD" (Kyiv, st. Surikova, building 3A) "RIDO GROUP LLC" (Kyiv, str. Avtozavodska, 27)

"Legion 2015 LLC" (Kyiv, pr. Povitroflotskyi, 19 A/1)

Total mileage for these chain of delivery will be 124,7 kilometres with delivered to customers' goods by Vista LLC obtained 290 pieces and 895,618 kilograms.

LLC "Vista" manufacturing process is presented in Fig. 2.8.

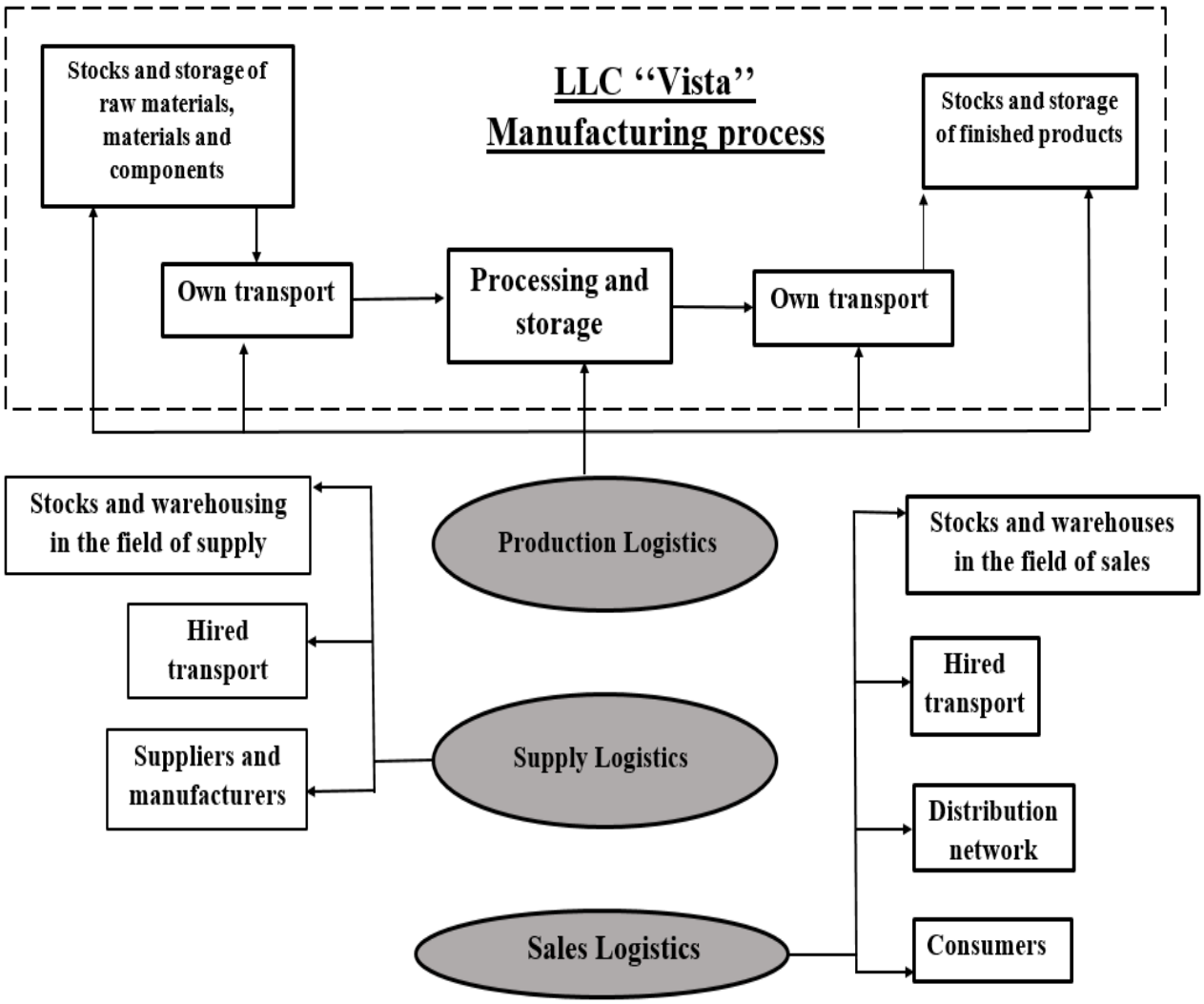

Figure 2.8 – LLC "Vista" manufacturing process

As it represented on a scheme, company has three types of logistics: production logistics, supply logistics and sales logistics.

Company orders raw material from supplies, delivers them to plant by own vehicle, then processing and storage process begins. After batches of production are ready, by own transport company delivers them to warehouse where finish products are stored, for this supply chain production logistics used.

Supply logistics are used for stock and warehousing in the field of supply, hired transport to take raw material from supplier and suppliers and manufacturers.

Sales logistics are used stocks and warehouse in the field of sales, hired transport to deliver goods to customers, also for distribution network and consumers.

Chapter 2 summary

In chapter 2 financial documentation of LLC was analysed: current and non-current assets, company liabilities, main customers, main suppliers, sold production and effectiveness of transport usage.

Also was collected statistics on the company's financial activity and volume of sales and purchase of raw materials for manufacturing of sauces. According to the collected statistics and analyses, the following conclusion were made: company has a growing potential, because all financial indicators such as profit, number of purchased raw materials, car mileage increasing, indicating that number of deliveries, earned money and number of manufactured products increased.

Research shows that the company has stable manufacturing process of different types of sauce production, also company has such customers as: MegaMarket, Epicentr, Eko Market, FOZZY group, Silpo, Domino's Pizza, VOVA, Evraziya, WellMart, UltraMarket, this indicates that company produces goods of high quality which could be purchased by huge distribution markets.

Such goals can only be achieved if the entire supply chain is closely coordinated to minimize overall channel inventory, eliminate bottlenecks, reduce lead

times and eliminate quality issues. This new competitive model suggests that some companies compete not as business to business, but as a supply chain.

Successful companies will be those whose supply chains are more profitable than those of their competitors.

CHAPTER 3
DEVELOPMENT OF PROPOSALS FOR IMPROVING THE SUPPLY CHAIN MANAGEMENT FOR SELF-PRODUCED FOOD PRODUCTS OF "VISTA" LLC

3.1 Recommendations for organization of cold supply chain management for «Vista» enterprise

A cold supply chain is a regulated supply chain temperature, which is a logistics and supply system that provides a number of means to maintain ideal conditions for goods in a given temperature range from the point of origin to the point of consumption. It is important to define that this also includes coordination and cooperation with trade partners, which can be suppliers, intermediaries, independent service providers and customers [33].

Cold supply chains as a concept are particularly common used for food products. As a rule, such chains supplies face great risks and uncertainties due to such problems such as rapid spoilage, a large variety of products that delivered, numerous suppliers of raw materials, short deadlines storage, regulatory requirements.

Cold logistics management activities usually include management of inbound and outbound transportation, fleet management, warehousing, material processing, order fulfilment, design logistics network, inventory management, supply/demand planning and management of third-party providers of logistics services.

The main "drivers" of the growth in demand for cold services logistics are food industry enterprises (for storage and seasonal fluctuations in storage volumes), importers and exporters food products, manufacturers and distributors of pharmaceutical products and biologically active supplements, medical companies, logistics operators, which are intermediaries and provide their logistics complex of higher levels, operators retail and flower companies.

Processes and their description in cold chain processes are shown in Table 3.1.

Table 3.1 – Cold chain processes

Name of technology	Description of processes in the cold chain
1	2
Management of product production processes	Products that require compliance with the temperature regime are made at enterprises that use special equipment and methods. Different types are available for finished products packaging technologies to preserve its temperature integrity, and also protect the product from damage.
Management of storage processes	Refrigerated warehouses are used to store products cold chain. The most optimal for this category goods have specialized distribution centers for support effective and timely storage of products. Among the key ones technological problems during storage highlight the increase energy efficiency of the object while simultaneously maintaining the range different temperature regimes.
Management of transportation processes	A number of transport technologies are available and have been improved for transportation of cold chain goods. Refrigerators vehicles and containers are among the most common with this technology. They usually use a connection refrigeration unit that require an energy generator. Exist several methods of transporting products with a cold chain, in particular refrigerators for cars.
Load, loading and warehousing processes	During loading, unloading or storage, the product exists there are many potential situations where a cold chain can be broken. The product can be left on the loading platform at a long period or the refrigeration unit can be turned off under overload time.

Food preservation is one of the most important issues during production, transportation and further sale products. Often in such cases, special requirements are put forward to temperature regime at all stages of movement of goods: from the manufacturer to sales of products through the trade network – to a simple buyer. With each of the buyer groups has its own requirements for cold stores. Based on this, mass construction of facilities with averaged parameters complicated Temperature is

the main parameter for evaluating compliance expiration dates for chilled and frozen products.

Therefore, preventing the loss of quality, as well as understanding the factors that contribute to them (uneducated or untrained employees, work failures systems) require further study of these problems. They can be to study experimentally or as optimization models in the distribution and variable storage parameters. A modern approach to the level of service consumers, the product safety and quality system should consist of provision of an adequate level of temperature control and monitoring regime of the product supply chain. Technologies consistently interact between itself to support the entire cold supply chain of enterprises.

Transportation. Refrigerant failure during transportation the equipment can after a few hours endanger the cold circuit depending on the ambient temperature. Because refrigeration equipment is designed to maintain a certain level temperatures products that have not previously been cooled can create excessive load on the equipment to the point that the temperature does not can be brought to the specified range. Due to wear and tear or faulty refrigerator equipment can create inappropriate environment for storage in the refrigerator, namely, poor circulation air and defective insulation.

Temperature monitoring of the logistics chain. The role of standards and standards deserves special attention. Cold logistics is complicated industry, especially in an international context where there are inconsistencies in general rules, rules for equipment, technologies and operations in companies, cities and countries. This applies to devices and systems capable of control the state of the cold chain, at least temperature and humidity, at all stages. These technologies provide accounting for the integrity of the chain and help identify potential flaws.

Temperature maintenance for the cold chain allows to save integrity of the product, maintaining its temperature in a certain temperature range. Many products, such as food, pharmaceuticals and some chemicals may be damaged if they are not within a certain temperature range.

Functionally, a cold chain can be considered as a close contact three elements:

1. The product has physical properties that require certain conditions for compliance with temperature and humidity and other external restrictions environment These conditions dictate its production, storage, transportation, implementation, which must take place in order not to violate physical properties. Otherwise, the product may lose its commercial value in whole or in part.

2. Production. Thanks to successes in cold chain logistics, it became it is possible to use more distant strategies of finding places location of production facilities, suppliers covering territories of the whole world. Conditions within the cold chain should be coordinated to support loading, unloading and cargo integrity.

3. Implementation. Methods and infrastructure available for transportation of the product under conditions of controlled temperature, may include containers with controlled temperature (refrigerators), cargo cars and storage facilities. During transportation of small batches, which have an extremely high cost, even refrigerated services (refrigerated trailers or containers) are dangerous to a large extent contributes to the growth of methods and methods of temperature control on the road. The presence of control devices guarantees the recipient that the integrity of the product was stored during transportation whenever it occurs breach, it helps identify the place in the supply chain where an integrity violation has occurred.

The main obstacles to implementation constant monitoring of the cold supply chain in the research process ae shown in Fig. 3.1.

The key issue is the temperature treatment of the cargo before transportation Equipment and devices are usually intended for maintaining a constant temperature, but not for bringing the cargo to optimal temperature. Other problems include cargo assignment and weather conditions in the regions. If the cargo will be exposed to strong cold or heat during the transport route, use a refrigerator with its own power supply usually reduces such problems.

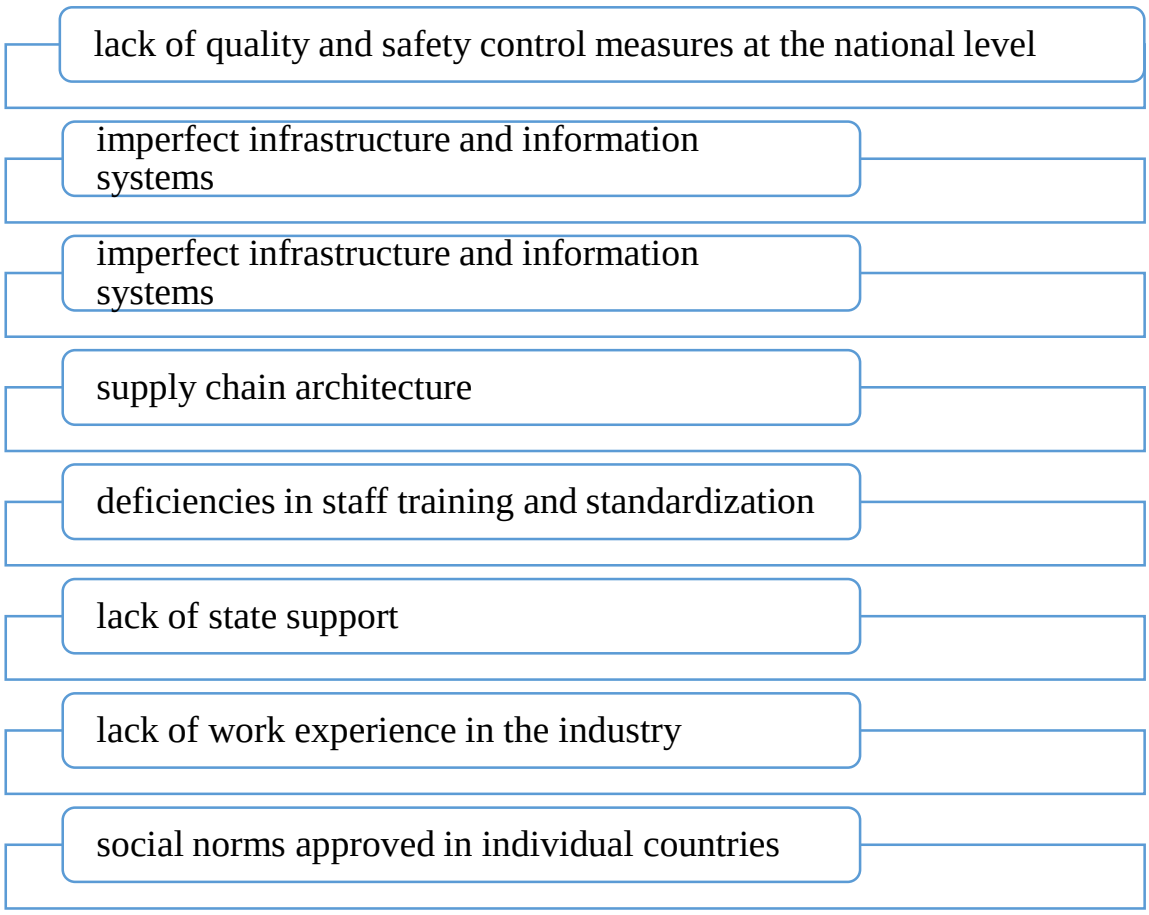

Figure 3.1 – The main obstacles to implementation constant monitoring of the cold supply chain in the research process

Benefits of cold chain are shown in Table 3.2.

For food industry enterprises as participants of cold supply chains, this procedure is standard. The table shows the main one's international standards that ensure traceability for products food industry.

While scientists are investigating various aspects of the cold chain the main directions of the development of the theory of cold logistics are emerging.

First, there is no agreed and accepted conceptual framework / or a reference model that could be used by scientists and practitioners work in this sector of cold logistics. Despite the existence many conceptual / reference models in other areas, cold logistics did not receive similar attention. So there are cold supply chains fertile territory for further work.

Table 3.2 – Benefits of cold chain

Name of factor	Name of activities
1	2
Minimization of costs	Attracting resources with optimal costs Differentiation of order delivery time Service level differentiation, including potential cost reduction
Optimization and efficiency	Optimization of production and assembly (production of products by individual order) Localization for stocks with an efficient tax regime Localization of the procurement organization with an effective regime taxation
Maximum flexibility and speed of response	Flexibility in using internal capabilities Flexible shift work/pay models Organization of the regional supply chain
Maximum efficiency of delivery	Cooperation with key suppliers, consumers, clients in the field of planning (effective forecasting) planning and transparency of supply chains
Simplification of supply chains	Development of multifunctional personnel to solve complex tasks, product adaptation to needs of the customer in the later stages, the use of distributors and partners on logistics channels, use outsourcing
Risk minimization	Increasing the number of supply sources and moving away from single source policies, analysis financial risks of suppliers and their reduction by with the help of partnerships with the distribution of responsibility for risks, transparency and constant control over operations indicators of the main suppliers
Sustainable development	Compliance Agreement with Supply Chain Partners ethical standards, environmental responsibility of the partner along the supply chain and procurement network, optimization at the level of emissions of greenhouse gases into the atmosphere, of other types environmental damage

Secondly, extensive experience in the field of modelling and optimization, accumulated over the past few decades, potentially could be used for cold supply chains. In fact, all segments extended cold chain can use this experience to improve

the efficiency of their activities, regardless of whether they are farmers, cold warehouses, food enterprises industry, distributors, distribution centres, retail traders or logistics service providers. However, the main focus should be devoted to how to minimize waste, reduce carbon emissions, maintain the quality and freshness of products and goods and, above all, minimize the cost of logistics operations.

Third, the risk and resilience of supply chains are increasing value due to the high degree of uncertainty and vulnerability associated with perishable products and goods – whether due to climate change or deficiencies in control operations and/or capabilities of enterprises.

Supply chains operating at low temperature for delivery perishable products, in contrast to chains operating at ambient temperature, more prone to natural disasters, environmental changes or system failures. Available risk models and stability requires further development, and then testing and validation in in the context of cold supply chains.

Fourth, additional empirical studies are needed in which the main focus is on strategic, tactical and operational the consequences of the introduction of management theory into the practice of enterprises cold supply chains. Specific problems faced different products and goods, can be specific both for the country and for individual branches of industry and enterprises.

Aspects of chain organization remain understudied cold supplies, implementation of effective development strategies within their limits.

The problems of determining the conditions for the development of the potential of the "cold logistics" of Ukraine is not given due attention, which determines its relevance research in this direction. The demand for such objects exists and has already appeared many companies (mainly international) ready to "pay extra" for quality.

Rapid market development, increased competition, demand for improvement the quality of customer service poses new challenges to companies. In order to maintain competitiveness and strengthen its key advantages, modern the enterprise

needs to optimize all value creation processes – from supply of raw materials to end-user service.

Trucks and vans, which are the main types of transport for this stage, must meet the technical conditions necessary for transferring the shipment to the cold chain. The final is also important transfer of cargo to refrigeration units, as there is a possibility violation of integrity and damage to products. Refrigerators have become the most important element of the cold chain supplies, as they offer a transport and storage unit with temperature controlled, but often too large for many types of cold chains. So, the problem the conditions under which the products are exposed to periodic and temporary conditions remain violations of the integrity of the cold chain, because these violations integrity is more difficult to detect. This leads to a decrease in the quality of the product, expiration dates or spoilage. To improve cold chain for Vista enterprise it is important to purchase modern trucks to carry refrigerator trailers.

This set of prerequisites is an important part of logistics support Suppose that a modern integrated cold chain management system is developed, but without implementation organizational, legal, personnel, financial and information measures, which would allow this innovation to be implemented, this system becomes insufficient and able to work. These measures themselves are not logistical, but they provide practical implementation of logistics management innovations stream, make it real. So, a new understanding of logistics support of cold supply chains includes the prerequisites that ensure it implementation or conditions of adaptation of the innovative management system to reality.

From the point of view of logistics, this problem can be attributed to the problems of the "make or buy" type (in the English-language literature, the Make-or-Buy Problem, or abbreviated as the MOV problem) [9]. Its essence is to make one of two alternative decisions: carry out transportation by own means; use the services of a specialized transport forwarding (logistics) company.

Of course, the solution to this problem depends on a number of external factors, as well as on the conditions of the capabilities of the enterprise itself. Having its own transport fleet usually reduces the trading company's dependence on

fluctuations in the transport and logistics services market. At the same time, specialized logistics companies can usually provide higher quality and lower cost of transportation.

The economic model for making a decision about the expediency or impracticality of creating one's own transport fleet is based on understanding the nature of the dependence of various types of costs on changes in freight traffic when using one's own and hired transport. At the same time, costs associated with the transportation of products, as well as other components of costs, are usually taken into account.

The complexity of the economic justification lies in the fact that not all significant factors that affect the feasibility of one or another decision can be presented in the form of costs, and therefore it is very difficult to take them into account in the general model. On the other hand, the implementation of such modelling allows to significantly reduce the uncertainty of the situation.

But to begin with, let's understand a simple economic model and try to answer the main questions with its help: which methodology allows us to justify the use of our own transport in comparison with the hired one for the transportation of our own goods, which is relevant for the Vista company.

The calculation process itself will be divided into two parts. The first part is raw data, the second part is calculation and analytics. Thus, by changing the initial data, we will be able to quickly model the situation and evaluate which indicators are essential in making the most effective decisions.

First of all, it is necessary to specify information about the vehicle that the company plans to purchase. In our calculations, we will consider a car (tractor), as well as a European-made tilt semi-trailer, with a carrying capacity of 20 tons, and a pallet capacity of 32 pallets, size 1200x800 mm (Euro type).

Table 3.3 shows characteristics of chosen truck for Vista enterprise, which will improve its cold chain

Table 3.3 – Chosen truck description

General information	Value
1	2
Truck	Iveco Stralis 460
Type of truck	For cargo transportation with awning
Carrying capacity (tons)	20
Pallet capacity 1200*800 mm	32
The cost of a new car in euros	8000
Euro/UAH exchange rate	43,5
The cost of a new car in UAH	348000
Depreciation rate of the car (%/year)	6,0

For VISTA company chosen vehicle as Iveco Stralis 460 (Fig. 3.2) would be optimal, because small company do not have opportunity to spend big amount of money on truck, but wants to improve its cold chain.

Figure 3.2 – Iveco Stralis 460 truck

As for trailers, it will be necessary to purchase trailer with temperature control to ensure products such as sauces, because they require temperature control (Fig. 3.3).

Figure 3.3 – Krone refrigerator trailer

It is necessary to determine the price of the car with a trailer and the coefficient of reduction of the cost of the car. The depreciation factor is very important, but in order not to complicate it, we will take the average annual value for calculations. In a detailed calculation, this indicator will need to be detailed, because it depends on many factors, such as: car mileage, physical technical condition, service life, etc. Each factor can affect its actual market value, and therefore how much a car loses in value from year to year.

Next, it is necessary to determine the operating characteristics that will directly affect operating costs. An important element in the calculations is the average annual car mileage. It can be argued that this is a basic indicator (Table 3.4).

The total mileage of a car can be divided into three parts: mileage for delivery of own goods, mileage for hire for return, and empty (inefficient) mileage. It should be noted that under "rental mileage for return" we will consider the mileage that the

«Vista» company can use to return cars to the loading point of its own cargo, with a centralized delivery model. If Vista plans to use a model where they have their own freight on the return routes, then the Own Freight Mileage Share will be 85% and the Return Hire Mileage Share will be 0.

Table 3.4 – Operating characteristics of the truck

Name of indicator	Value
1	2
Mileage per day (km/day)	265
Mileage in a month (km/month)	7950
Fuel consumption with cargo (l/100 km)	30
Fuel consumption of an empty car (l/100 km)	23
The cost of fuel (UAH/l)	52

However, in further calculations, it will also be necessary to consider the expediency of using a share of the mileage for hire, for example, in the ratio of 45% own cargo and 40% for hire.

Another of the most important operating indicators, which is also the costliest, is fuel costs. In our calculations, we will take the average fuel consumption of the car. The only thing we will do is divide the fuel consumption into: "fuel consumption with a load" and "fuel consumption of an empty car". With a low coefficient of "empty runs", such distribution will not have a significant impact on the simulation result, but the accuracy of the calculations will be higher.

Of course, with a more detailed justification, the fuel consumption indicator should be considered from the point of view of the influence of other factors, namely: the seasonality of transportation, the period of operation and the total mileage of the car, fuel consumption for a loaded and empty car, etc. Another indicator is, of course, the cost of fuel itself. In our calculations, we will assume that the cost of fuel is not discounted from year to year, although with a more detailed calculation, the cost of fuel should be discounted, like many other indicators.

The next indicators are maintenance and repair (MRO), which include many component costs (Table 3.5).

Table 3.5 – Values for truck maintenance and repair

Indicator	Value
1	2
Average cost of maintenance (UAH)	38000
Maintenance frequency (km)	55000
Initial cost of repairs per year (UAH)	5000
The coefficient of increase in repair (k)	4
Periodicity of increasing repairs (km)	300000
Periodicity of tire replacement (km)	125000
The cost of a set of tires (UAH)	280000
The cost of overhauling the engine (UAH)	500000
Periodicity of overhaul of the engine (km)	800000

First of all, this is routine maintenance (MO). With more detailed calculations, this indicator can be more detailed, taking into account, for example, mileage and the real cost of each maintenance. For our calculations, we took the average value of the cost. And the next logical indicator should be the "Maintenance Interval", which shows how often the maintenance is carried out.

Another expense item that affects the cost of transportation is the so-called "Unscheduled repairs." In our calculations, we will use the indicator of the cost of such repairs for a new car, as well as the coefficient of increase of unscheduled repairs depending on the mileage of the car. We will take these indicators as averaged, because in practice there is no clear linear dependence of the increase in unscheduled repairs on the mileage or life of the car. As a rule, unscheduled repairs include certain minor repairs and spare parts that are not related to major repairs and maintenance.

An important factor in costs and maintenance is overhaul of the car engine. Usually, it depends on the mileage, so the frequency of repairs is calculated based on this indicator.

The next components of costs are the so-called "fixed costs" (Table 3.6). Fixed costs include the payroll fund (FOP) with taxes for drivers, as well as office and service personnel. In addition, fixed costs include maintenance of the office and repair base, as well as other costs that are not directly related to the mileage of the car.

Table 3.6 – Fixed costs

Indicator	Value
1	2
Number of drivers per 1 car	1
1 driver's license with taxes	29816
Travel expenses per day (UAH/day)	250
Fixed costs for 1 car (office, repair base, etc.) UAH/month	55000
Fixed costs for hired transport for 1 car (office) UAH/month	25000
Insurance of 1 car (UAH/year)	10000
Other expenses for 1 car (UAH/month)	2500

Sometimes there are doubts as to where to attribute the driver's salary indicator: to the variable or constant costs of the company. Usually, if drivers receive a salary (SW) depending on the mileage travelled, then this is definitely a variable cost. If the drivers receive a rate that does not depend on how much the car drives under their control, then such costs can be classified as permanent. So, we can conclude: the more the car will pass under the load, the smaller will be the share of drivers' wages in the total costs for the period, and therefore, the higher will be the efficiency.

For a more accurate calculation of opportunity costs, the indicator "Fixed costs when using hired transport" was added. After all, we will compare different cost structures, on the one hand, when driving our own transport, on the other hand, when driving a hired one. In both cases, an office and staff are needed. But a repair base with separate service personnel is needed only if you have your own transport.

All cost calculations for these components were given for one unit of transport. We can argue that the more units of vehicles a company has, the smaller the proportion of fixed costs in the cost price for each vehicle will be, and therefore, the higher the efficiency of each unit of transport will be. Also, we included insurance and other additional unforeseen expenses as permanent expenses.

In addition to all the above-mentioned component costs, we also need to know the "market tariff" – this is a very important parameter that is used to calculate exactly the profitable part of car operation (Table 3.7). To calculate the received income, it is necessary to multiply this indicator by the actual effective mileage (that is, the mileage under the load).

Table 3.7 – Market value of transport services

Name of indicator	Value
1	2
The market price of transportation for 1 km by own transport (UAH/km)	48
Market cost of transportation for 1 km by external transport (UAH/km)	54

Now we move on to the second part – calculation and analytics. First of all, we need to determine the so-called "point of indifference", that is, the amount of daily mileage below which it is more profitable to use hired transport, and above which it becomes more profitable to keep one's own cars.

To do this, you need to calculate the average cost of owning your own car for different daily mileage options and compare these costs with the combined costs of renting a car for the same daily mileage options.

Let's start with the costs of operating your own car, the calculations of which are given in the Table. 3.8.

Considering the fact that none of the specified daily mileages reach 800,000 km mileage per year (which are necessary for engine overhaul), this component of costs was not taken into account in the calculations.

Table 3.8 – Calculation of annual costs for own truck operation

Indicators	Possible variants of car mileage per day, km									
	50	100	150	200	250	300	350	400	450	500
1	2	3	4	5	6	7	8	9	10	11
Total car mileage per year, km	12258	24516	36774	49032	61290	73548	85806	98064	110322	122580
Fuel costs, UAH	191225	382450	573675	764900	956125	1147350	1338575	1529800	1721025	1912250
Number of maintenance for the specified period, times	0	0	0	0	1	1	1	1	2	2
Maintenance costs, UAH	0	0	0	0	38000	38000	38000	38000	76000	76000
Expenditures for current works, UAH	20000	20000	20000	20000	20000	20000	20000	20000	20000	20000
Total variable costs per year, UAH	211225	402450	593675	784900	976125	1167350	1358575	1549800	1741025	1932250
Drivers' wages fund, UAH	360000	360000	360000	360000	360000	360000	360000	360000	360000	360000
Fixed costs for 1 car (office/maintenance), UAH	660000	660000	660000	660000	660000	660000	660000	660000	660000	660000
Annual insurance, UAH	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000
Other fixed costs, UAH	20000	20000	20000	20000	20000	20000	20000	20000	20000	20000
Total fixed costs per year, UAH	1050000	1050000	1050000	1050000	1050000	1050000	1050000	1050000	1050000	1050000
Total expenses for own car, UAH	1261225	1452450	1643675	1834900	2026125	2217350	2408575	2599800	2791025	2982250
Cumulative expenses for own car in an increasing manner, UAH	1261225	2522450	3783675	5044900	6306125	7567350	8828575	10089800	11351025	12612250
Cumulative costs per 1 km of total mileage, UAH	102.89	59.24	44.70	37.42	33.06	30.15	28.07	26.51	25.30	24.33

The graphical dependence of fixed costs, variable costs and total costs of operating one's own car on the amount of daily mileage is presented in Fig. 3.4.

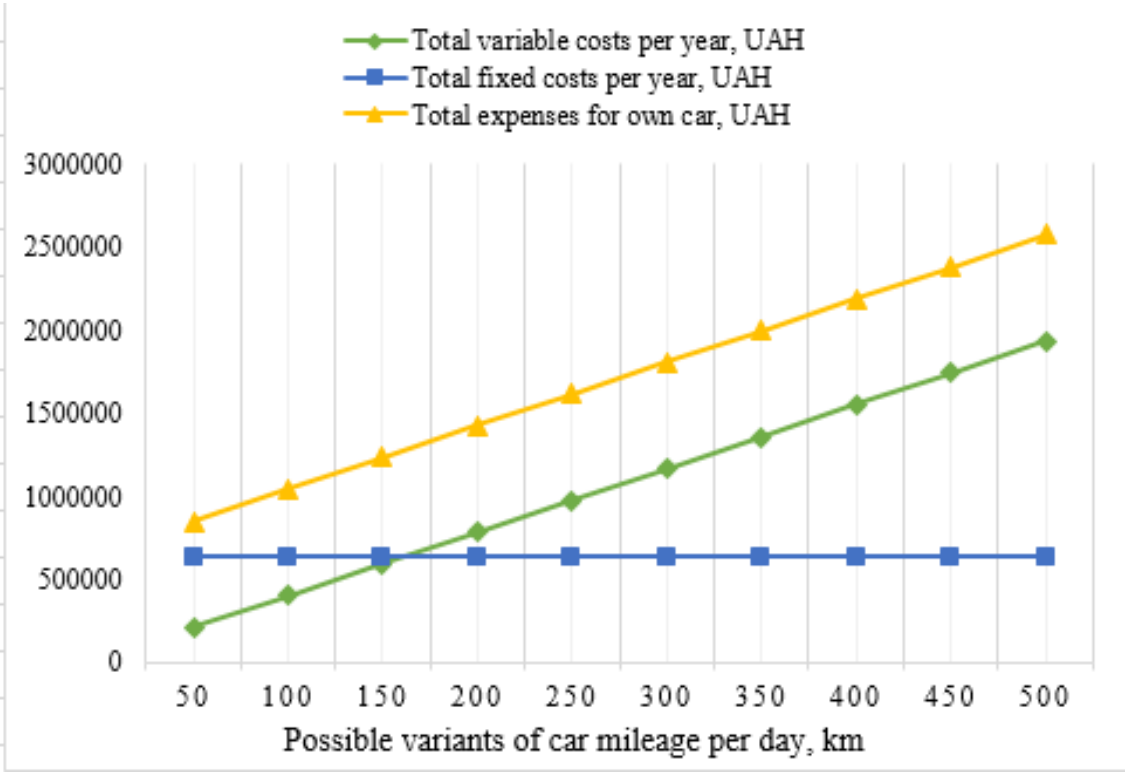

Figure 3.4 – Graphic dependence of the costs of operating one's own car on the amount of daily mileage

In addition, it is necessary to distinguish "market value of transportation by own transport" and "market value of transportation by external transport". The market value of transportation by own transport is actively used in the case of a centralized delivery system, when it is necessary to return the transport to the point of loading with own cargo very quickly. In this case, usually the tariff for cargo transportation is lower than the average on the market. The main factors in this case are the speed of return of the transport and the coverage of the main costs associated with this.

Now let's calculate the costs incurred by the company during the operation of the rented car (Table 3.9).

The calculation of the effect of switching to own car is presented in the Table 3.10.

Table 3.9 – Calculation of annual costs for operating a rented car

Indicator	Possible variants of car mileage per day, km									
	50	100	150	200	250	300	350	400	450	500
1	2	3	4	5	6	7	8	9	10	11
Market price of transportation services per 1 km, UAH	54,0	54,0	54,0	54,0	54,0	54,0	54,0	54,0	54,0	54,0
Annual mileage of the car, for which payment is made when hiring, km	12258	24516	36774	49032	61290	73548	85806	98064	110322	122580
Expenses for renting a car, UAH	661932	1323864	1985796	2647728	3309660	3971592	4633524	5295456	5957388	6619320
Fixed costs for a rented car, UAH	300000	300000	300000	300000	300000	300000	300000	300000	300000	300000
Total expenses for a rented car, UAH	961932	1623864	2285796	2947728	3609660	4271592	4933524	5595456	6257388	6919320
Cumulative expenses for a rented car in an increasing manner, UAH	961932	1923864	2885796	3847728	4809660	5771592	6733524	7695456	8657388	9619320

Table 3.10 – Calculation of the effect of switching to the use of one's own car

Indicator	Possible variants of car mileage per day, km									
	50	100	150	200	250	300	350	400	450	500
1	2	3	4	5	6	7	8	9	10	11
Total expenses for own car, UAH	1261225	1452450	1643675	1834900	2026125	2217350	2408575	2599800	2791025	2982250
Total expenses for a rented car, UAH	961932	1623864	2285796	2947728	3609660	4271592	4933524	5595456	6257388	6919320
The effect of switching to own car, UAH	-299293	171414	642121	1112828	1583535	2054242	2524949	2995656	3466363	3937070

We calculated the effect of switching to one's own car as the difference between the total costs of a rented car and the total costs of one's own car. That is, we can claim that the effect in our case is cost savings. Graphical finding of the "point of indifference" is presented in Fig. 3.5.

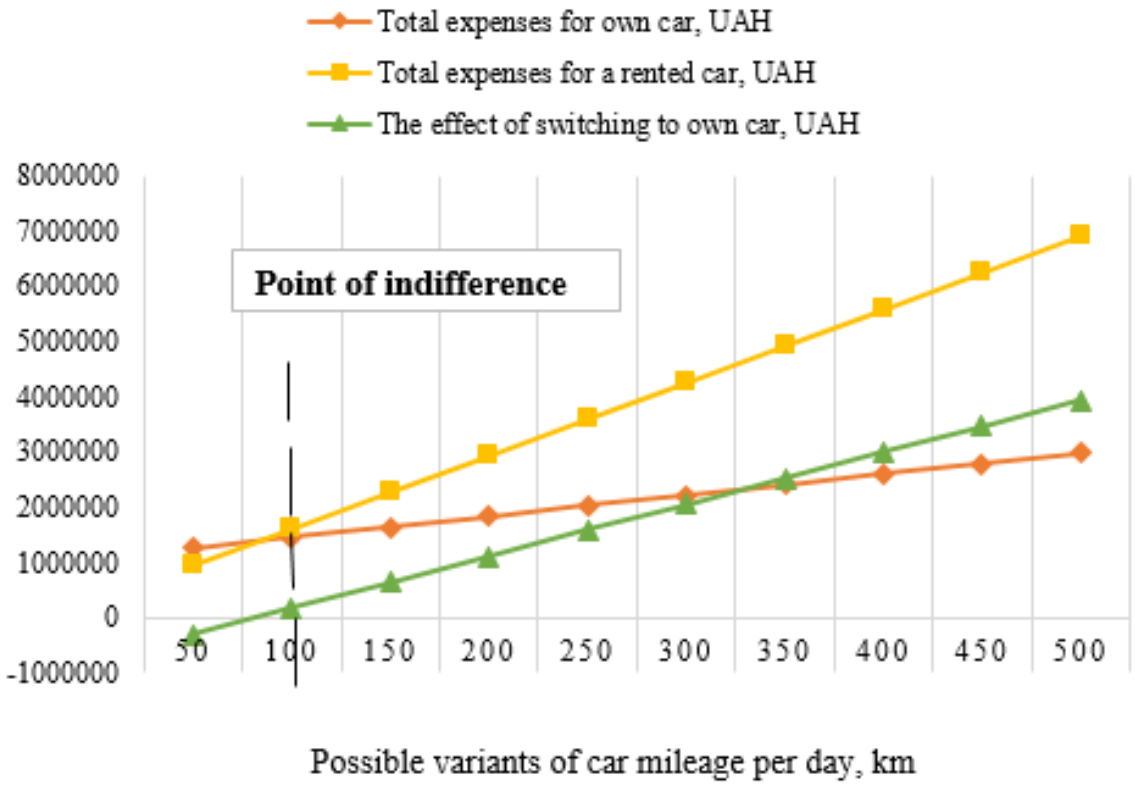

Figure 3.5 – Graphical finding of the "point of indifference"

According to the calculations, we can conclude that the mileage indicator has a significant impact on achieving a positive economic result of using one's own transport. The higher the value of the mileage, the higher the chance of obtaining a positive economic effect from the use of own transport.

According to our calculations, if the mileage of 1 car is more than 100 km per day, it will be more appropriate for «Vista» to use its own transport, that is, to create its own fleet.

According to the forecasts of the «Vista» company, the average mileage per car will be 300 km per day, and therefore the decision to switch to using one's own transport is economically beneficial. After all, according to the calculations given in

the Table 3.10, this will enable «Vista» to save more than UAH 2 million per year on each car. That is, we can say that such savings can be considered as a positive effect (additional profit) for the company.

3.2 Recommendations for improving supply chain management for self-produced food products for «Vista» enterprise

Innovations in logistics and supply chain management are reflecting global demographic, technological and political trends. They allow enterprises to optimize logistics processes: use resources more efficiently, combine local competences with global "economy of scale", to find new counterparties in supply chains. In this regard, it is important to note that logistic innovations can be attributed to the class of management, which, in turn, if necessary, condition the appearance of technological innovations, the main ones the role in the logistics of which is played by information systems.

It is necessary to note the fact that information technologies are beginning to be actively involved in logistics activities, in particular in management cold supply chains. After researching scientific articles, we have highlighted some IT innovations that are gaining popularity in the field of cold logistics and supply chain management.

In Fig 3.6 is shown how blockchain facilitates supply chain operations.

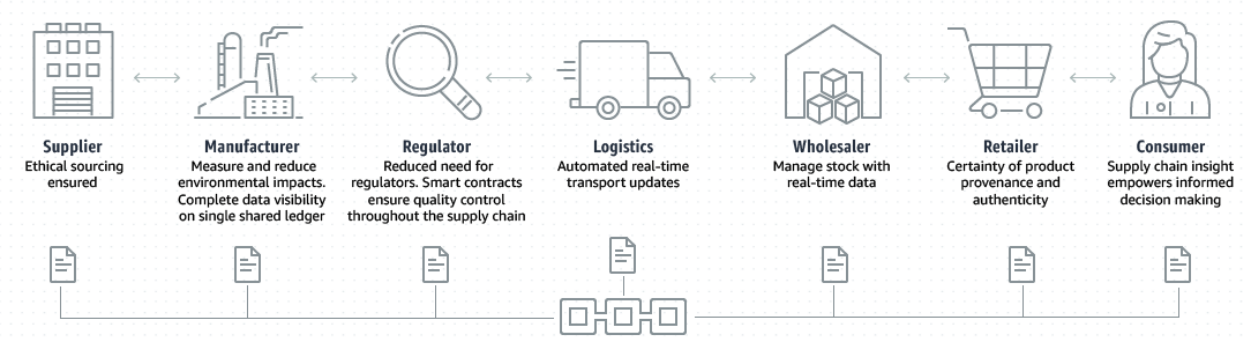

Figure 3.6 – Blockchain in supply chain operations [1]

Cold logistics is considered as an industry responsible for coordination, synchronization, management and optimization of all processes, related to the production, transportation and sale of various products, that is, with material flow management.

Today, technology has a huge impact on fundamentals economy, business and state. They change people's understanding of trade, ownership and interaction of market players. A change in business models has led to the need for technology that can provide transparency and security of all related processes.

Blockchain is a distributed electronic ledger, shared across a network of servers that records transactions in cryptographic units. Although many aspects of implementation of information technologies were focused on such issues as operational characteristics of vehicles and navigation, transactional aspects remained difficult in logistical procedures, especially when it is about international operations. Enterprises were able to digitize and automate some management processes, but agreements between firms and the growing volume of information necessary for their successful completion, remained a problem.

Main elements of blockchain and their impact on supply chain roles are shown in Table 3.11.

Table 3.11 – Main elements of blockchain and their impact on supply chain roles

Elements of blockchain	Impact on supply chain roles
1	2
Scalability	Scalability improves as vendors participate in the overall supply chain system (not different depending on different companies, as in traditional supply chain architecture). The scalability of distributors is improved, because in general all their customers (wholesalers, retailers) to the ledger may be readily available. The scalability of blockchain improves interaction with consumers, as they are more aware of the size and functionality of the chain supplies due to information about transaction tags, and their trust in system is growing.

The end of Table 3.11

1	2
Performance	Blockchain performance reinforces this step as it is high the speed of sending and verifying transactions (compared to traditional banking methods) provides fast and reliable liquidity of payments. The latest blockchain implementations are designed to provide high transaction throughput per second.
Consensus	Blockchain consensus offers trust to the entire supply chain system. Country of origin, quality and other details are recorded in the form marks in the ledger, adding value to the final product. Consumers are sure that the quality and general characteristics of the product are that the blockchain registry confirms that they exist; the value is added to product.
Privacy	Although blockchains are considered public accounting by book, privacy can be designed to facilitate access control of who will have access to the information contained in blocks. Blockchain provides privacy in the sense that private transactions are not visible (but legally verified) by parties who transaction issuers may not want to display.
Location	The location-based supply chain becomes flexible. Manufacturers cooperate with various supplier companies and by distributors worldwide, while transactions are regulated country and do not depend on legislation with a fast level presentation and validation. Distributors cooperate with various wholesale and retail companies around the world.
Cost	Blockchain operating costs can be significantly reduced in comparison with traditional bank payments. the total cost of the final product increases, and at the same time its price significantly decreases, which makes consumers happier than in the traditional one supply chain system in terms of quality and price.

Blockchain creates a platform of digital trust that implies it is almost impossible to falsify information after it is entered, as well as the ability for all participating parties to verify and track each step. Whenever a new transaction occurs, a new block is created and is added to existing blocks.

In Table 3.12 are shown elements of blockchain which are used in cold supply chains. All blocks are updated on the network at the same time and contain a complete history transactions involved, thereby maintaining chain integrity (or chain of trust). Each block is a unique digital object that stored on several servers (nodes) in

a temporary network, which checks that each copy of the block matches its equivalent on all nodes.

Table 3.12 – Elements of blockchain and their usage in cold supply chains

Principles of blockchain	Elements that are used in cold supply chains
1	2
Distributed database	Each party in the blockchain has access to the entire database and its complete database history, i.e. Neither party controls the data or information, and each party can inspect the records of its transaction partners directly, without intermediaries.
Peer-to-peer transfer	Communication occurs directly between nodes, and not through central node, i.e. Each node stores and transmits information to all other nodes.
Transparency	Every transaction and its value is visible to anyone who has access to system, i.e. Each node or user has a unique 30-digit number a symbolic alphanumeric address that identifies it. Users can remain anonymous or provide confirmation of their identity others when transactions take place between blockchain addresses.
Irrevocability of reports	Once the transaction is entered into the database and the accounts are updated, the records are not can be changed because they are associated with each record transaction before them. Different computational algorithms and approaches deployed to ensure that a database entry is persistent, chronologically ordered and available to everyone else on the network.
Computational logic	The digital nature of the ledger means that blockchain transactions can be related to computational logic and, in fact, can be programmed, that is, users can set algorithms and rules and automatically initiate transactions between nodes.

On Fig. 3.7 quantitative effect of implementation of integrated supply chain management is shown.

The use of blockchain technologies can be generalized categories of record keeping and transaction simplification. This helps to establish such issues as ownership and rights to any physical or an information object such as a currency unit, ticket, commodity, or asset. It also includes the ability to use (or transfer) such facility in a safe manner. Another important aspect of technology blockchains "start" contracts. They belong to programs (algorithms), that use the information contained

in the blockchain for automatic execution of an agreed procedure, such as a transaction or reporting.

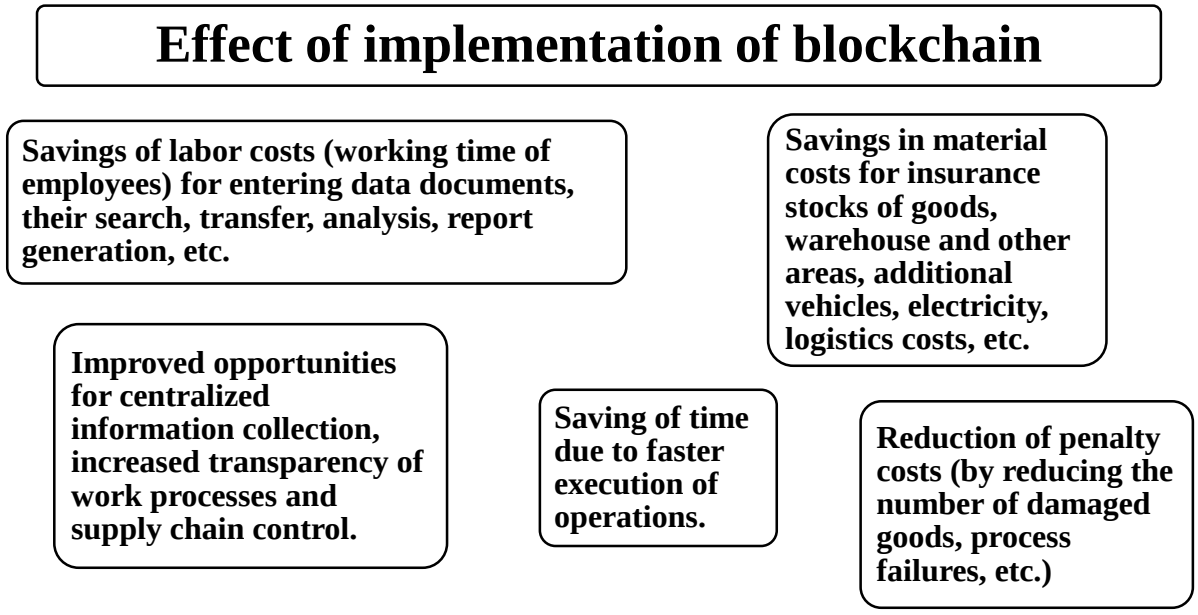

Figure 3.7 – Effect of implementation of blockchain

The use of blockchain can be divided into four main ones' categories, which on the one hand are related to record keeping, and on the other – to the purpose facilitating transactions: static ledger, smart contracts, dynamic register, payment infrastructure.

The main purpose of blockchain is to provide value for its sphere application. The following elements help formulate its value proposition proposal: principles, functions, use of information, processes, result.

The commercial purpose of blockchain is to create value for logistics chains. Due to the transactional intensity of logistics, it is important value proposition includes contract management, coordination (stakeholders can share information more effectively) and absence of mediation (interested parties can directly interact without a third party). Automated calculations (smart contracts) can also be arranged so that payments are made, when a set of conditions has been met and verified.

For self-produced food products safety, such a system also has serious advantages, because it will not allow transporting prohibited goods. The main advantage of this system is that the data is stored on more than one specific one servers, and scattered on thousands of servers around the world. Any participant such a system has access to registers, which allows the system to be open and transparent The principle of operation of the blockchain system is that digital the records fall into blocks of information, and then by means of cryptographic methods and principles of simple mathematics are combined in chains of complex mathematical algorithms.

Each block is linked to another block, and new block entries are always made join at the end of the working chain. Next comes the encryption process data using a large number of computers around the world which called hashing. If all calculations lead to the same result, each block receives an individual code, which is called electronic signature.

It is almost impossible to forge such a signature, because then it is necessary would concentrate more than half of the world's computing resources in a single chain. There is only the possibility to add new records, it is also worth it remember that the registry update takes place in the entire network at once and simultaneously. The main feature of blockchain-based databases is that information is virtually impossible to hack or distort because if change the original documents, they immediately receive a new digital one a signature that will signal an error in the system. This project allows any user to have access to any logistics service and to have access to any supplier logistics service.

The most important condition for the existence of modern cold chains supply is their competitiveness and flexibility, the ability to quickly and qualitatively carry out customer requests. And it is the implementation in the supply chain modern information technology helps to maintain this condition.

The most common option for evaluating the effect of the implementation of integrated supply chain management is the calculation of the net present value – Net Present Value (NPV).

The NPV of the project is equal to the difference between the future value of the stream of expected revenues and the present value of the current and future costs of the project throughout the considered period.

NPV formula is shown in 3.1.

$$NPV = \sum_{t=0}^{T} \frac{C_t}{(1+r)^t} \quad (3.1)$$

.

Consider a software development start-up that is contemplating an investment of 1600000 UAH to develop a blockchain on Vista enterprise.

The expected cash inflows from this investment are projected to be 1000000 per year for the next three years.

Assuming a discount rate of 15%, we can calculate the NPV as follows:

Year 1: 1000000 / (1 + 0.15) ^1 = 869565.22 UAH

Year 2: 1000000/ (1 + 0.15) ^2 = 756143.67 UAH

Year 3: 1000000/ (1 + 0.15) ^3 = 657516.23 UAH

NPV = -1600000 UAH + 869565.22 UAH + 756143.67 UAH + 657516.23 UAH = 683225.12 UAH

With a positive NPV of 683225.12 UAH, this investment is considered financially viable as it generates a return greater than the initial investment cost.

Now, let’s calculate Payback Period (PP).

Consider a scenario where Vista company expect to earn a 1600000 sum in three years to cover expenses on implementation of blockchain system.

Formula of PP is presented in 3.2.

$$\text{payback period} = \frac{\text{initial investment}}{\text{annual cash flow}} \quad (3.2)$$

.

PP = 1600000/ 1000000 = 1.6 years.

So, implementation of blockchain will be payed off after 1 and a half years.

Therefore, the use of the integration of blockchain technology for logistics is just beginning to be used in the market, although the prospects it opens up for companies in the supply chain are very impressive. The very integration of blockchain technology to manage perishable supply chains requires a period of adaptation, implementation and testing. The logistics and supply chain management market will soon begin to change under the influence of new technology integration, as more and more people learn about it and see the benefits of using it.

Chapter 3 summary

To improve "Vista" LLC supply chain, it will be reasonable to purchase trucks with refrigerators. This will help to create cold chain, because such type of goods as sauces require temperature control. Nowadays company has ordinary trucks and it has disadvantage that company couldn’t perform deliveries on more than 1000 kilometers. By purchasing refrigerators, this problem will be solved and company will be able to reduce transportation costs, because more delivery points will be covered.

Cold logistics is considered as an industry responsible for coordination, synchronization, management and optimization of all processes, related to the production, transportation and sale of various products, that is, with material flow management.

Blockchain is a distributed electronic ledger, shared across a network of servers that records transactions in cryptographic units. Although many aspects of implementation of information technologies were focused on such issues as operational characteristics of vehicles and navigation, transactional aspects remained difficult in logistical procedures, especially when it is about international operations. Enterprises were able to digitize and automate some management processes, but

agreements between firms and the growing volume of information necessary for their successful completion, remained a problem.

For self-produced food products safety, such a system also has serious advantages, because it will not allow transporting prohibited goods. The main advantage of this system is that the data is stored on more than one specific one servers, and scattered on thousands of servers around the world. Any participant such a system has access to registers, which allows the system to be open and transparent The principle of operation of the blockchain system is that digital the records fall into blocks of information, and then by means of cryptographic methods and principles of simple mathematics are combined in chains of complex mathematical algorithms.

The implementation of the blockchain system will be a profitable solution for the simplification and transparency of manufacturing and delivery processes, which are key for the company. The effective use of such tools is possible only on the basis of an integrated logistics system. A single information space will help create a “single point” at which it is possible to receive any information about the progress of the process of manufacturing and delivery of goods to consumers.

CONCLUSIONS AND RECOMMENDATIONS

Nowadays, activities aimed at managing the supply chain have become equally important in product promotion than marketing. By attracting buyers through a well-structured marketing campaign, it is impossible to increase a product's market share without an effective supply chain process.

The supply chain includes many business processes such as manufacturing, material supply, purchasing, inventory management, distribution, sales forecasting, sales and customer service. In addition to these processes, it may include processes of distribution, retail and logistics companies, as well as processes for delivering and processing products to consumers.

The success and profit of a company depend on effective supply chain management. The enterprise cannot independently control the production and distribution of products. The responsibility and competitiveness of a product or service in the supply chain depends not only on the company, but also on the entire supply chain. These companies are legally independent of each other, but economically they are very interdependent. Thus, the supply chain is a production system that includes all parties involved along the path from the raw material stage to the consumer stage.

The specifics of the food industry present great complexity and diversity in the flow of goods, services and information. For example, different types of raw materials received from suppliers must be stored in a warehouse to ensure proper storage conditions for each type of raw material. Production must be planned, different production facilities are used for each type of product, taking into account the needs of the consumer, demand, spare capacity and resources, and production costs and relevant characteristics and shelf life. It is necessary to organize, among them, the transportation of raw materials and finished products, timely delivery of finished products to customers and distributors, as well as taking into account the level of minimization of costs and the highest quality of customer service.

The development of customer markets and globalization in planned operations are expanding the prerequisites for the hardware and data advances utilized. The vehicle distance is protracting, the coordinated factors chain is turning out to be more mind boggling, more extra connections show up in it – dissemination focuses, cross-dock locales. During the development of products, there is a need to control the phases of its transportation, where an infringement of temperature conditions might happen, which prompts a deficiency of nature of merchandise that are delicate to temperature changes.

The main components of the cold chain that ensure its operation are, first of all, technologies that are implemented using software and hardware systems and trained qualified personnel. The use of equipment that meets legal requirements for a specific type of temperature cargo, and compliance with rules and restrictions on joint storage and transportation are the basis of the cold chain. Failure to comply with these requirements leads to damage to the cargo: a reduction in its shelf life or loss of quality and properties. The equipment necessary to ensure the cold chain is insulated vans, wagons, refrigerated vehicles, refrigerated wagons, and specialized warehouses.

It was analyzed the financial documentation of LLC: current and non-current assets, company liabilities, main customers, main suppliers, sold production and effectiveness of transport usage.

It was collected statistics on the company's financial activity and volume of sales and purchase of raw materials for manufacturing of sauces. According to the collected statistics and analyses I made the following conclusions: company has a growing potential, because all financial indicators such as profit, number of purchased raw materials, car mileage increasing, indicating that number of deliveries, earned money and number of manufactured products increased.

Research shows that the company has stable manufacturing process of different types of sauce production, also company has such customers as: MegaMarket, Epicentr, Eko Market, FOZZY group, Silpo, Domino's Pizza, VOVA, Evraziya, WellMart, UltraMarket, this indicates that company produces goods of high quality which could be purchased by huge distribution markets.

Such goals can only be achieved if the entire supply chain is closely coordinated to minimize overall channel inventory, eliminate bottlenecks, reduce lead times and eliminate quality issues. This new competitive model suggests that some companies compete not as business to business, but as a supply chain.

Successful companies will be those whose supply chains are more profitable than those of their competitors.

To improve «Vista» LLC supply chain, it will be reasonable to purchase trucks with refrigerators. This will help to create cold chain, because such type of goods as sauces require temperature control. Nowadays company has ordinary trucks and it has disadvantage that company couldn't perform deliveries on more than 1000 kilometers. By purchasing refrigerators, this problem will be solved and company will be able to reduce transportation costs, because more delivery points will be covered.

According to the forecasts of the «Vista» company, the average mileage per car will be 300 km per day, and therefore the decision to purchase own transport is economically beneficial. After all, according to the calculations given, this will enable Vista to save more than UAH 1.4 million per year on each car. That is, we can say that such savings can be considered as a positive effect (additional profit) for the company.

Cold logistics is considered as an industry responsible for coordination, synchronization, management and optimization of all processes, related to the production, transportation and sale of various products, that is, with material flow management.

Blockchain is a distributed electronic ledger, shared across a network of servers that records transactions in cryptographic units. Although many aspects of implementation of information technologies were focused on such issues as operational characteristics of vehicles and navigation, transactional aspects remained difficult in logistical procedures, especially when it is about international operations. Enterprises were able to digitize and automate some management processes, but

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